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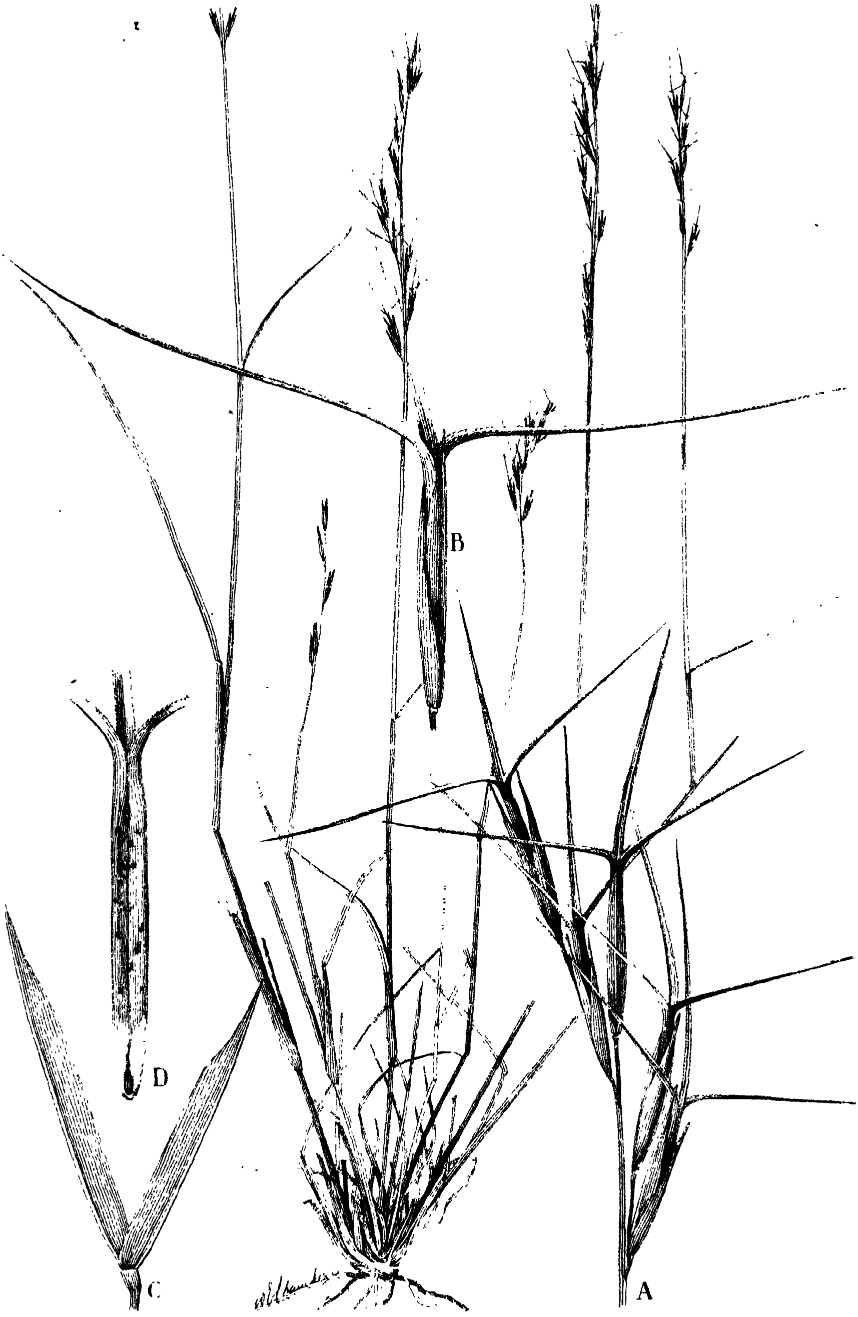


ARISTIDA RAMOSA, R. BR.

Vol. XI. Part 7. *JULY.*

Useful Australian Plants.

By J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

No. 63.—*Aristida ramosa*, R. Br.

Botanical name.—*Aristida*, already explained; *ramosa*, Latin—full of branches, in allusion to the inflorescence.

Botanical Description (B. Fl. vii, 563).—Very nearly allied to *A. calycina*, and almost intermediate between that and *A. vagans*. (See April *Gazette*.)

Value as a fodder.—A dry, wiry grass, sometimes very tough and full of fibre. During the winter months it affords some pasture, but in summer bearing too much seed and flower-stalks to be of much use as feed.

I have already alluded, in this series of papers, both under *Stipa* and *Aristida*, to the barbed flowering glumes and awns of these grasses, and how injurious they are to sheep. I attach a separate note on the subject, as the remarks apply more or less generally to the whole of the species of *Stipa* and *Aristida*. (See p. 534.)

Habitat and Range.—Found in South Australia, Queensland, and New South Wales. In our Colony it occurs in the coast districts and table-lands, its most southerly locality appearing to be the Clyde-Braidwood district. In the western districts it has been sparingly recorded as far west as the Darling River. It is also found in New Guinea.

Reference to Plate.

A. Portion of inflorescence (nat. size).
B. Three-pronged awn (enlarged).
C. Outer glumes.
D. Part of awn, showing its offensiveness as a weapon to pierce the skin of sheep.

No. 64.—*Aristida calycina*, R. Br.

Botanical name.—*Calycina*, Latin, adjective from *calyx*, a cup (in Botany, *calyx*); hence, having a prominent calyx or outer glumes (in the present species).

Botanical Description.—(B. Fl. vii, 563)—

Stems tufted, erect, 1 to 2 feet high. (Mr. A. R. Crawford has measured it up to 6 feet 6 inches.—J.H.M.)
Leaves very narrow, mostly subulate.

Panicle narrow, often above 6 inches long, with few short erect branches, rarely at length spreading, each bearing one or two or the lower ones several, but few sessile or shortly pedicellate spikelets.
Spikelets in the typical form, 4 to 5 lines long without the awns.
Outer glumes with fine points, the second as long or longer than the flowering glume.
Awns slender, sessile, ¾ to 1½ inch long.
Palea rather long.

Value as a fodder.—Usually a very dry, coarse grass, rarely affording a bite for stock. Its short awns are very injurious to sheep. Mr. Forester Kidston, of Condobolin, thus alludes to it:—"The celebrated No. 9 Grass, the most hurtful of all our grasses, the seed going right through to the paunch." No. 9 is, of course, an allusion to the gauge of fencing-wire, and other *Aristidas, Xerotes longifolia,* and other plants with exceptionally tough leaves are also referred to by country people as No. 9 or No. 10. This grass affords an excellent illustration of the variability in quality of the same grass in various parts of the Colony. Mr. A. R. Crawford of Walcha, New England, writes to me:—"On the eastern slopes stock eat this grass at all times; in time of drought it is the chief stand-by. It will grow in the most arid places, and shoots from the joints quickly after rain. I have seen it used for brooms, and it was said to wear as well as millet." (Surely the very old stems are referred to.)

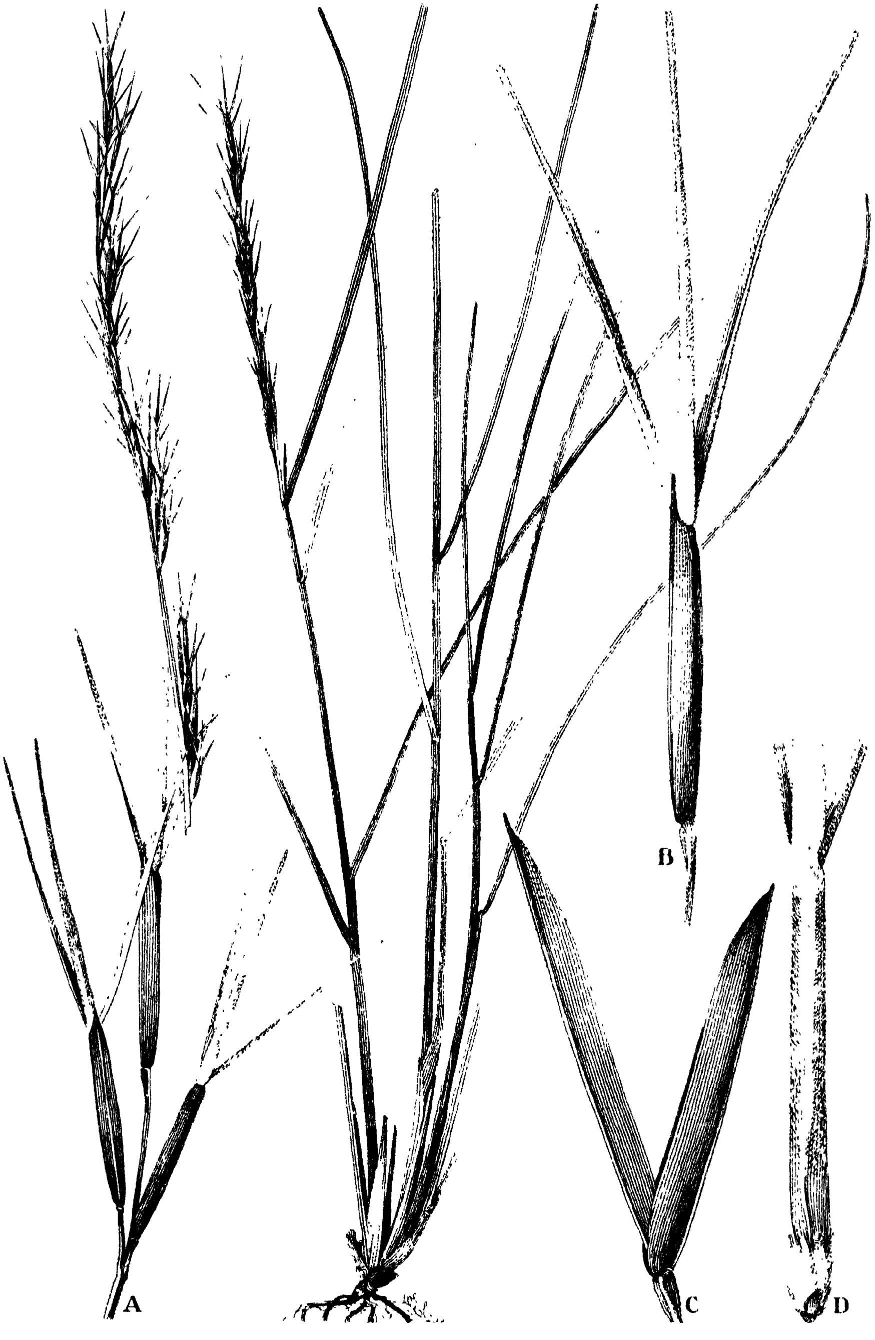
Habitat and Range.—Found in all the colonies, except Tasmania, principally on the sand-hills in the arid districts.

REFERENCE TO PLATE.

A. Portion of inflorescence (nat. size).
B. Three-pronged awn (enlarged).
C. Outer glumes.
D. Part of awn, showing its offensiveness as a weapon to pierce the skin of sheep.

In connection with the barbed flowering glumes and awns of *Stipa* and *Aristida,* which make these spear-grasses so dreaded, it will be of interest to some to be able to refer to some papers in which the mechanism is fully explained, and the morphological and physiological questions involved gone into. Following are the titles of some:—

1. On the Hygroscopic Mechanism by which certain seeds are enabled to bury themselves in the ground. By FRANCIS DARWIN. (*Trans. Linn. Soc.* i, Botany, 149.)
   The author's observations were made (*inter alia*) on the following genera of grasses interesting to Australians:—*Stipa, Heteropogon, Anthistiria* (Kangaroo Grass). His observations are mainly confined to *Stipa,* are of a detailed character, and form the basis of most that has since been written on the subject. The paper also contains a valuable Bibliography of the subject.
2. Hygroscopic Seeds. By FRANCIS DARWIN. A letter in *Nature,* xv, 374.
   The author deals with the twisting of the "seed" of *Aristida* (the genus now being dealt with in the *Gazette*) which was omitted from his former research.
3. The anchoring of Feather-grass (*Stipa pennata*) fruits for purpose of germination. "The Natural History of Plants." By KERNER V. MARILAUN (Trans. Oliver, i, 616, *et seq.*).
   An interesting popular account of the torsion of the fruits of *Stipa* and other genera.
4. Read the chapter on the relation of the morphological nature of organs to adaptation in Sach's "Text-book of Botany."
5. See also the "Text-book of Botany" (Strasburger and others, trans. Porter). Read the sections "Hygroscopic curvatures (Imbibition) movements" and "Germination."



ARISTIDA CALYCINA, R. BR.

Bee-Wintering.

ALBERT GALE.

"While the earth remaineth, summer and winter shall not cease" is a Divine promise; but, notwithstanding, New South Wales bee-keepers find, as far as the honey flow is concerned, that, at least, in some parts of this Colony, we have no winter—that is, winter such as necessitates the taking of extra precautions to guard against the severity of the cold. With the bees, "summer and winter" are only relative terms, known to them by the extension or contraction of light and darkness. That is the only sense in which that Scriptural promise to them holds good. They do not know it by the abundance or cessation of the honey flow. Nay, if such were the case, the bees' winter would be when the sunshine is most intense and the days longest. Often in summer time, in this Colony of floods and droughts, the little busy bee is put to her wit's end to find the means of livelihood, to say nothing of a surplus for storage on which to raise the ever increasing brood. In some years, what other countries would term the best for a honey flow, with us it is the worst. Indeed, in some parts of this Colony, while some bee-keepers are gloating over their great profits for the season, others are entertaining the thought of Jeremiah's wish, "Oh! that my head were water and mine eyes a fountain of tears that I might weep," because I have to feed back to my bees, this summer, the profits of last.

"Apiology," if I may be permitted to coin a word, because it is more expressive for my purpose than apiculture, in this country requires the study of the laws of bee-life far more acutely than that of any other bee-keeping country with which I am acquainted. Other bee countries are not subjected to the great changes, in season and out of season, that we are here. The bee-keeping people in Europe and America have their Spring, Summer, Autumn, and Winter with utmost regularity, the periods differing but little year after year. I do not mean to say that each year or season is equally resultant, but I do mean to say that within a week or so they know what will follow and can prepare for it accordingly. I have known a midwinter season when the honey-bearing flora were so advanced, the honey flow so good, the brood so plentiful, and circumstances, both domestic and climatic, that a swarm issued forth at that usually unfavourable season. At other times I have known the floral season so backward that swarming has been delayed till well on to midsummer. In the Old Country I once knew a swarm of bees found hanging on a gate-post when the ground was white with snow; they were starved out.

New South Wales, with climatic districts verging from the torrid zone on the one side, to the frigid, eternal snows on the other—what different adaptations have to be sought and to be found so as to overcome the various necessities and requirements of bees under these circumstances. Cold and hard frosty nights compelling the bees to seek the warmest parts of the hive, followed by a day when the sun shines out with almost summer heat, thus tempting the bees out, not only to bask in the sunlight, which is always a health-giving exercise, but if stores be short tempting them far afield in search of food, when the sudden cold, as the sun drops westward, causes the death of many of the valuable little toilers. Taking this into account, it will be impossible for me to give such an exhaustive article as I should like on this important phase in bee management; therefore each district must glean for itself that which is most suited to its wants. Experience and common-sense are the two most important factors to be used herewith.

What are the essentials most to be observed in prolonging health and life under adverse climatic changes? It matters not whether it be in members of the vegetable or the animal kingdom. Our endemic plants are not all equally proof against the changes of climate any more than are the exotics. The care necessary in our hot-houses and conservatories will best answer this. Nature has given numberless animals, besides bees, the power to guard against the privations of winter. I have no need to catalogue them. How has she instructed others to so guard against the scarcity of winter food, and to provide means whereby they can fight against want and defy the cold when it is standing below zero? With the herbiverous animals, by laying on an extra accumulation of fat; with some species of squirrels, by storing a winter's supply of food; with some birds, by uniting to build a common home of extra warmth for nocturnal shelter and protection against the pelting rains, and thus they, huddling together, live through the winter; with some, ophidians, by hibernation; with others, by semi-hibernation, awakening in the warmer hours of the day to feast on autumnal gathered stores. Again, some lay-on fat, and construct huge warm and dry nests, wherein they sleep till the warm days of spring awake them.

Are not these, collectively, analogous of the requirements of bees, and has not Nature taught our bees how to act? Has she not implanted in them an instinctive knowledge how to overcome the obstacles of winter in the various climatic zones of the earth? Nevertheless they have an instinct that will never leave them—that of storing. In those parts of the Colony where "never ending spring abides," they store with all the energy and prudence as in the northern world, and that trait of storing will never forsake them. If left to their own instinct they will store food sufficient to overcome almost any winter. But the bee-keeper, with that selfish greed for gain, too often extracts the last pound of honey, in the hope that his bees will be able to weather the winter's storms. By so acting, spring will show him that he has "killed the hen that laid the golden egg." I do not mean to say that it is always the bee-keeper's fault that the bees die. Sometimes our summers and autumns are cruel and unkind to our bees, withholding the honey flow, and they die from natural want.

Can you not gather from what I have already said, what are the essentials necessary for wintering bees: a sufficiency of food, perfectly dry quarters, the heat obtained by density of clustering, fresh air and ventilation; for in all the cases mentioned air is to be noted as one of the constituents.

A sufficiency of food; but what kind of food, and what quantity. The quantity of food necessary for a strong colony to pull through winter, and to come out in spring healthy and vigorous, is about 25 lb. This will depend on the length of the winter and its severity. It is far better to leave a pound too much than an ounce too little. The winter's supply should be of capped comb, and so distributed that the two outer combs on either side should have about equal quantities; and where the winters are most severe, pop-holes should be made through the combs to save the bees the danger of coming in contact with the cold air surrounding the inner side of the walls of the hive.

The kind of food. "What is good for the goose is good for the gander." What is good for the babe is good for the parent; but not *all that is good for the parent* is good for the babe. No mother would fill the stomach of a week-old babe with corned beef, pickled onions, and boiled cabbage; but where is the adult who would not live and thrive on baby food. Indeed in cases of physical decay, caused by starvation or disease, human sufferers have to return again to babyhood as it regards food, before the strength of manhood can be regained. Why baby-food for a starving or physically weak man? Because it is the most nutritious. We all, as bee-keepers, know the food of young bees differs as their age increases, and that queens, during their baby days, are fed with the same baby-food throughout. Why? I think this is something we have yet to learn. What is this chyle food—this bee-milk fed to young bees. What are its constituent parts? Honey, pollen, water, semi-digested by the nurse bees. This is fed to the young bees in a similar way, and for the same purpose, as young mammals are fed by the dam, or, as St. Paul puts it, "fed by milk that they may grow thereby."

The Americans assert that the only food necessary to bring bees through the winter is honey or sugar, and if pollen be excluded from the bill of fare, dysentery and other abdominal complaints will not occur. I am not so sure of that. In the Old Land, in the days of my youth, when I kept bees in the old straw skip—when we used to smother a certain proportion of the stocks with sulphur, leaving the rest for the next season's increase, I noticed that the bees that came out in the warmer parts of the winter days were those that were starving, and when these were fed on sugar, as a rule, dysentery followed; but the strong stocks that were left with plenty of pollen and honey were the healthiest in the spring, and gave the earliest swarms. All animals know by instinct the most fitting food. Pollen to bees is nothing new. They know their two principal foods, pollen and honey, and how to choose the beneficial and eschew the deleterious. Bees consume honey to produce heat and energy; pollen to build up the waste of nerve and muscle. They know which to select by the dictates of Nature. So in leaving the winter's supply of honey see that there is proportionately a sufficient supply of pollen. In this Colony, in winter or summer, I have never lost bees by starvation, because I never interfere with the food supply of the brood-chamber. Do not do it; there is nothing to be gained by it, but frequently a great loss. Your bees will come out better in the spring; they will swarm earlier, all else being equal; there will be less mortality. The old and infirm will be sure to die, but the young will be healthy and strong so as to commence the new season's duties with vigour.

The temperature: Bees can endure great extremes of temperature, even below freezing-point. Francis Hubër immersed a swarm of bees for three hours in water and they revived. I once found a gin-case of bees that had been brought down the river during a flood, and they were as active as if they had just swarmed therein. I cannot tell from whence they came. But with these experiments health is too much interfered with. The question with us is not what extremes of heat, or what extremes of cold, bees can best endure, but how can we best protect our bees by administering to their wants that they may best serve ours. Heat may be produced and conserved in various ways. A full stomach is as good as an extra blanket. That man who has put up his bees for winter, and has given them a sufficiency of food and a little over, has taken the bull by the horns—the first and best step of producing and keeping the required warmth in his hive during the winter months. The hive itself should be free from open joints and cracks. Ventilation in winter is as requisite as in summer, but not to the same extent; but then that ventilation must be systematic and judicious. The bees, by their constant breathing, will keep the oxygen in circulation. There must therefore be a means of escape of the heated air so that the fresh invigorating air may take its place and so benefit the inmates of the hive.

The numerical strength of the colony is another important factor in producing and retaining the warmth of the stock. When bees cluster closely together they are in a condition to maintain about 65° of heat in winter, and if a closely fitting division board has been inserted so as to keep the bees and their supplies handy and well together, the outer circle of bees will be as warm as those in the centre of the cluster. On the other hand, if the space they occupy be too large, there will be a greater amount of mortality than if they have only sufficient room and no more. Empty or unused combs should be most religiously removed. These absorb heat, and that is so much taken from the inmates. Even if they do not absorb the heat they will absorb moisture, and mildew, thus militating against the health of the colony.

Paper is a first-class non-conductor of heat; therefore, in our coldest districts, if the hives are lined with cardboard, and sheets of paper placed over the top bars, it would conduce greatly in retaining the natural heat of the bees. Further, outside protection should by no means be neglected, but whatever material be used it must be impervious to rain.

If the hives have flat tops, a sheet of well-trimmmed bark half as long and broad again as the hive may be used. It should be well and evenly weighted down, or fastened, to prevent the wind blowing it off. In exposed situations it would be well not to use weights, but drive in a couple of stout pegs at each side of the hive and lash the bark with cord. For the purpose nothing could be better than a clothes-line (such as is usually procurable for about 4d.), and for a shilling or two length enough could be obtained to do a great many hives. Where the cover is only an inch or so beyond the top of the hive, water dribbles under. For gable-roofed hives a cover of bagging which has received a coat of paint or tar will do. Cornsacks coated in this way would last for several winters.

Internal dampness must be avoided, and floor-boards kept clean. These are better renewed during the middle part of warm days. By no means attempt to winter weak stocks. Far better carry one strong colony through the winter than half a dozen weak ones; in proportion, they consume far less food.

But, above all, do not be avaricious, and rob your bees of the last ounce of honey and then expect them to pull through the winter.

TRIAL OF NEW VARIETIES OF MAIZE IN ULLADULLA DISTRICT.

IT will be remembered that some time ago the Department obtained from America samples of a number of varieties of maize for trial in this Colony. After the requirements of the departmental farms were met there remained a quantity of seed for distribution in small lots to farmers in various parts of the Colony.

Mr. C. A. Cork, Hon. Secretary to the Ulladulla Agricultural Association, procured, on behalf of the farmers in that district, a small quantity of the imported seed and divided it among some thirty-three farmers who applied to him for trial packets. Mr. Cork has carefully watched the experiments and now reports that the concensus of opinion is that the new maize is well worthy of attention. It is of course difficult to come to a conclusive opinion in a single season, but the majority of farmers appear to think that the results will be better next year. One point on which all agree is that most of the samples produced are a distinct improvement, inasmuch as they ripen fully a month earlier than the local varieties. This, Mr. Cork points out, is a great advantage to the farmers in Ulladulla district, because it will allow them to utilise the same ground for a winter crop. Whether this advantage will be retained after the maize has been acclimatised remains to be proved.

Notes on a Collection of Ticks, determined by Professor Neumann.

By WALTER W. FROGGATT,
Government Entomologist.

NEARLY two years ago, taking a great interest in the external parasites of animals, and the Queensland cattle-tick in particular, I arranged with Mr. Bruce (Chief Inspector of Stock) to supply every one of his country Stock Inspectors with a postal block to collect specimens for the Entomological Branch. This postal block consists of a piece of cedar, 5 inches long and 2 inches in diameter, with a ⅝-inch hole bored in from one end, but not quite through; at the bottom of the hole is placed a pad of cotton wool; then a small corked glass tube full of spirits of wine is inserted, with a broad tape beneath, so that the ends come up above the cork on either side. These tags are folded over the cork, and an outer cork inserted in the hole in the wooden block and cut off flush with the end. The address was pasted upon each block, directing it to our Department, and then enclosed in a wrapper to the Stock Inspector, with directions how to open and return the packet. The following specimens, sent to Professor G. Neumann, of the Ecole Veterinaire, Toulouse, France, who has devoted a great amount of study to the *Ixodidæ* and published a very fine monograph upon the group, were chiefly collected in this manner, supplemented with others collected by myself. As most of our native animals, as well as the domestic ones, are known to be more or less infested with ticks, lice, or mites, while nearly all our native birds have their own peculiar parasite either feeding upon the feathers or sucking up the blood through the skin, it will be understood what a large field to work there is ahead before we have an exact knowledge of these groups of mites and insects.

These external parasites may be grouped under two great heads: first the mites and ticks (which are not true insects, as they have four pairs of legs in the adult state and are more nearly related to the spiders; their mouth is produced into a sharp beak, covered with barbs, known as a rostrum in the true ticks, and though many of the mites have a somewhat similar mouth and burrow into, or attach themselves to the skin, others run about freely upon their host. The second group contains the lice (some known as sucking-lice, and the others as fly-lice) and the fleas. All these lice and fleas are considered by entomologists to be true *diptera* or flies, but through their degraded habits and depraved tastes have gone down in the scale of insect life, the sucking-lice and fleas, losing their wings through want of use, while the fly-lice have, through different habits, retained their wings, though in a very rudimentary form. As the unattached parasites leave the animal or bird which they infest as soon as it is dead, they are much more difficult to obtain than the ticks which cannot extract their hooked beaks so readily, so that less work has been done by collectors with the lice than the ticks.

I should be very glad to send a collecting tube to any of our country readers who would undertake to collect these insects, with instructions how to look for and pack them.

The following are the names of the species of *Ixodidæ* determined by Neumann :—

(1.) The common Bush or Dog Tick. *Ixodes holocyclus*, Newm.

This is the common species in the bush around Sydney and most of the coastal districts. It infests the low shrubs, and one plant in particular (*Kunzia capitata*) is popularly known as the "Tick-bush" on this account. From the foliage it falls into one's clothes, and has the habit of generally attaching itself to one's neck. On a damp day at Clifton I once took five off my neck after coming out of the scrub. If it once gets its rostrum through the skin it is very difficult to extract; but killing the tick with kerosene, and then snipping the body off with a sharp pair of scissors, is the bushman's approved method.

(12.) The Platypus Tick. *Ixodes ornithorhynchi*, Lucas.

The only specimens of this species were mounted and given to me by Mr. A. G. Hamilton, of Mount Kembla. I believe it is very common in this creature.

(3.) The Snake Tick. *Amblyomma moreliae*, L. Koch.

This species was described from specimens taken upon our carpet snake (*Morelia spilotes*). Our specimens were taken upon a kangaroo, Coonamble, and upon horses at Narrabri and Coonabarabran.

(4.) Cattle Tick. *Amblyomma triguttatum*, C. L. Koch.

This is the common large species found upon cattle and horses in New South Wales. I have specimens upon paddymelons, Barham; cattle, Dubbo; dogs, Narrabri; cattle, Narrabri.

(5.) The Lizard Tick. *Aponomma hydrosauri*, Denny.

This is our common lizard tick, and takes its specific name from our large Monitor lizard (*Hydrosaurus varius*), commonly known as the "gohanna." I have specimens taken upon this lizard at Goulburn, and upon an *Echidna* (porcupine) at Bombala.

(6.) Snake Tick. *Aponomma decorosum*, L. Koch.

This is another species obtained from a snake skin sent in to the Australian Museum, from the Goulburn District.

(7.) Beetle Ticks. *Aponomma ecinctum,* Neum.

This is very common upon one of our large lamellicorn beetles (*Aulacocyclus kaupi,* Much.) which lives upon decaying wood, under logs. The back of the beetle's head and under surface of the body is sometimes covered with them. This is a new species for which Professor Neumann proposes the above name.

(8.) A Cattle Tick. *Aponomma trimaculatum,* Lucas.

A large species sent from Narrabri, taken upon cattle.

(9.) A Cattle Tick. *Haemaphysalis Leachi,* Aud.

Another species, obtained from Grafton and Wallangra upon horses and cattle.

(10.) Cattle Tick. *Haemaphysalis longicornis,* Neum.

This is a new species taken upon cattle at Narrabri and Kempsey.

(11.) Queensland Cattle Tick. *Rhipicephalus annulatus,* Say.
var. Australis.

This dreaded pest has never yet been recorded from this Colony, and is easily indentified from all the above species by its white legs, a peculiarity which it alone possesses. These specimens were brought to me from the Island of Neui, close to New Britain. The cattle upon which they were found were shipped from Cooktown, North Queensland to New Caledonia, purchased there and sent on to New Britain, showing how easy it is to spread animal parasites from one country to another.

(12.) The Fowl Tick. *Argas Americanus,* Packard.

This is our common Fowl Tick, only too well known all over the colonies, and generally worst in the dry inland districts. I have had specimens from Milparinka, in the far north-west, and from Hay and Deniliquin, in the south. Many complaints reach the Department every season about the ravages of this pest in the fowl-yards, and when it once infests a fowl-house badly, it is most difficult to eradicate. Poultry farmers would do well to quarantine all new importations into their fowl-yards, and to build their chicken houses so that they can be kept spick and span.

Soil Bacteria.

R. HELMS.

THE discovery of the important part played by certain bacteria within the soil in converting nitrogenous substances into nitric acid, in which form plants assimilate one of their most important food-stuffs, has created a clearer conception of the processes by which such chemical changes are brought about. This, together with the discovery that certain plants by means of similar minute organisms in their roots can utilise the nitrogen of the atmosphere, has opened out new vistas to scientific agriculture.

Besides these oxidising organisms a number of others occur extensively, which act in the reverse manner by reducing nitric acid to ammonia, or even to nitrogen, and thereby play, on the whole, an even more important part in the economy of nature, although in many instances their action is the reverse of beneficial to plant life. These are known as reducing or denitrifying organisms in contradistinction to the first mentioned, which have been named nitrifying bacteria.

Anything we can do to increase the development of the nitrifying bacteria, or to design methods for checking the too rapid multiplication of the reducing organisms, will, at the same time, be the means of increasing the fertility of the soil, improving those soils that are poor and maintaining the productiveness of more fertile ones, since of all the factors on which the fruitfulness of land depends, the power of nitrification is undoubtedly the most important.

Investigations with this aim in view, carried on during late years in the greater number of countries where agriculture is pursued according to advanced principles and with modern appliances, have led to promising results, and these researches, together with the better understanding of the value of manures, are beginning to produce a revolution in the theory and practice of agronomy.

Since the functions of these organisms are considerably affected by their surroundings, and they behave differently in different soils and climates, these differences may prove to be very pronounced in Australia where both soil and climate are so extremely variable and peculiar. It is therefore not possible to accept, as conclusive, the results obtained by investigators in other countries, and it becomes necessary to study their behaviour under local conditions.

Before further discussing the different groups of soil bacteria and dwelling upon their characteristics, it is desirable to sketch the history of their discovery in an epitomised form, and to present the results hitherto obtained by different investigators.

Historical.

As far back as 1862, Pasteur surmised that nitrification in soil was due to micro-organisms. Up to his epoch-making investigations, fermentations were considered to be the result of purely chemical reaction, and it was but natural that after proving the important part played by the yeast organisms, he should go so far as to consider other phenomena involving complex chemical changes as being connected with similar microbes.

Schloessing and Müntz proved in 1878 that the action of minute organisms caused nitrification, or the transformation of ammonium salts into nitrites and nitrates by oxidation. This fact was confirmed by Warington in the same year. A definite knowledge of the specific organisms producing the alteration of nitrous compounds were, however, not obtained.

Heræus was the first who, in 1886, applied the modern methods of bacteriological research to this subject. He claims to have obtained positive results. By means of elaborate investigations on a large number of bacteria obtained from soil, water, and air he managed to produce pure cultures. Amongst them he credited four distinct bacilli with nitrifying power.

Frank soon after made lengthy investigations on bacteria isolated from several kinds of soil, and obtained entirely negative results. In consequence, he disputed the vital process in connection with nitrification. This conclusion was rebutted by Plath and Baumann in 1887.

Celli and Marino Zucco in the meantime had experimented with five micrococci isolated from the highly nitrated water of Rome, but did not succeed in proving that any of these were the specially qualified nitrifying organisms.

Warington examined, in 1888, a large number of bacteria obtained from soil for their nitrifying power without arriving at the desired result; but when, instead of his pure cultures, he took ordinary soil for seeding his food media with, he always succeeded in inducing nitrification. These researches led him to the conclusion that the specific organisms had yet to be found.

Further, Percy Frankland and Grace Frankland have paid attention to this important question. Although they experimented with twelve different organisms isolated from soil, the result was in every case a negative one; but, as with Warington, when using a little of the soil from which the organisms had been obtained, nitrification was readily excited in the culture fluids.

As these many experiments of such able bacteriologists failed to prove a definite nitrifying organism, the results of Schloessing and Müntz were attacked anew, and it was again doubted whether organisms played any part at all in nitrification.

At this stage, the famous Winogradsky, of Zürich, took the question up, and by his masterly handling of the subject produced definite and important results.

From the experience gained by experimenting with such a large number of different organisms during several years, and by the foremost bacteriologists, it had become apparent that those capable of inducing nitrification could not be numerous, and that probably only one or two might exclusively possess this characteristic. It had, moreover, become plain to him that the organism in question did not thrive on the ordinary nutrient media composed of organic substances in general use for the artificial cultivation of pathogenic and other microbes. Winogradsky very ingeniously took advantage of this peculiarity. By sowing ordinary gelatine plates with cultures derived from various soil-bacteria, he induced a vigorous growth of species that flourished in this medium, and then grafted in suitable fluids from the spots which showed no development. Thus he succeeded in separating the nitrifying organisms. Further discussion of the methods of manipulation is needless, but he ultimately proved a somewhat oval-shaped organism to be possessed of the characteristic power to nitrify ammonium salts.

The puzzle was solved at last, and led to more definite studies being continued by Winogradsky and others. The technique of bacteriology had meanwhile been enriched by the clever invention of Kühne, who provided a solid culture medium free from organic substances by gelatinising silica. This allowed of reliable work being done in a more rapid manner.

Several species, or may be varieties, of nitrite-producing organisms have been detected in soils from different parts of the globe, and it seems fairly certain that nitrifying organisms are universally distributed and found in most soils, but are present in greatest number in fertile areas. Less is known of the nitrate-forming organisms, and it is surmised by some that these may possibly be a modified stage, so to say, of the former.

From experiments made in laboratories it has been ascertained that in cultures seeded with soil the development of nitrites precedes that of nitrates. Thus ammonia is first converted into nitrous acid, and this later into nitric acid.

This has led to the conclusion that two physiologically distinct organisms are required to accomplish the transformation of ammonia into nitrates. Winogradsky is of this opinion, and claims to have separated the nitrate-forming microbe.

He has proposed for the group of nitrifying organisms the name of *Nitrobacteria*, giving the generic term *Nitrosomonas* to the nitrates-forming types, and *Nitrobacter* to those who transform nitrites into nitrates.

Nitrogen-fixing Bacteria.

Besides the nitrifying bacteria which are able to transform ammonium salts found naturally in soil, or have been added thereto, into other nitrogenous compounds, a number of related organisms are met with in many fields which have the power of utilising the free nitrogen of the atmosphere and drawing from this vast store of almost inert gas considerable quantities for plant-food. These are the nitrogen-fixing bacteria.

On the rootlets of many higher plants, more especially on those of the *Leguminosæ*, small nodules in varying numbers are found produced by and filled with bacteria. It is supposed that by the *symbiosis* (a living together) of these lowest forms of plant-life with the higher plants, the latter derive the nitrogenous food which it is proved cannot have been derived from the soil, and therefore must have been obtained from the atmosphere. The process is not yet properly understood, but the general opinion tends towards the assumption that the bacteria fix the free nitrogen within the nodules and that the resulting nitrogenous compounds are assimilated by the host-plant. By some also it is thought that through the peculiar conditions of "living together" the plant is enabled to fix free nitrogen in its foliage.

Whatever may be the correct theory, the effect of this remarkable interaction between the low forms and the higher plants is very striking and very variable in extent. Even amongst the *Leguminosæ*, the plants deriving the greatest advantage from this phenomenon, extremes are met with; some deriving apparently but little benefit from it, whilst on the other hand many may very largely depend upon it. Amongst the Lupines, for instance, the yellow flowering variety is able to entirely dispense with nitrogenous substances in the soil.

Through the exhaustive investigations made first by Professors Hellriegel and Willfarth, and later by Lawes, Gilbert, and others, on nearly all the cultivated leguminous plants, no doubt has been left that the nodules found on the roots are formed through bacteria, and that these are able to fix free nitrogen for the use of the plant they attach themselves to. Until Hellriegel proved that the presence of bacteria is necessary to enable plants to utilise the nitrogen of the atmosphere, and that, for this reason, *Leguminosæ* may almost entirely dispense with nitrogenous manuring of the soil they grow upon, and in many instances even enrich the land with nitrogen, these observed facts were not properly understood.

It was well known in practice that clover and lucerne would grow vigorously for a period of years without being manured, and when flagging could often be invigorated by a dressing with gypsum. This tends to prove that these crops did not sicken for the want of nitrogenous food, but on account of other elements becoming exhausted or unobtainable for some reason from the soil.

A palpable proof that the help of bacteria is almost absolutely necessary to enable plants to assimilate atmospheric nitrogen, is afforded by the fact that seedlings, say, of peas, will not thrive unless the soil contains at least some traces of nitrogenous compounds; but as soon as they have made a start and have sent out rootlets upon which the bacteria can form colonies, they prosper independently of the presence of this food in the soil.

During the experiments carried on in several German agricultural establishments it was discovered that every species of legumes was associated with a specially sympathetic bacterium which would not perform the office of fixing nitrogen for other species. Based upon the acquisition of this knowledge, Professor Nobbe, of Tharand, in Saxony, is now preparing a number of pure cultures of these specific bacteria for the purpose of sowing them together with their respective culture plants. These cultures are placed on the market under the name of *Nitragin,* and for some time have been undergoing and still undergo practical tests regarding their efficacy of promoting the growth of plants.

It has not been definitely ascertained how long these artificial cultures can retain their vitality unimpaired; and, besides, in some instances, adverse seasons have prevented a definite judgment being arrived at as yet, whether the results obtained in trial plots can be maintained on a larger scale in the field. Considerable attention is being paid to this question at the agricultural stations in Germany as well as in the United States and elsewhere.

The Denitrifying Bacteria.

In addition to the organisms hitherto referred to, all of which are pre-eminently friendly to plant-life, and thus indirectly to man, there are a host of other bacteria met with in soil and water which play an important part in connection with agriculture.

Their action is to reduce the compound organic substances into less complex combinations, or into simple elements, and in this manner make them again available for plants to which otherwise they would be lost, as these can utilise nothing but elements or simple compounds for their nutrition.

It is manifest that were it not for the decomposition of the many complex substances taken from the earth in the shape of plants and animals, after these have changed from the active state called life to that of inactivity or death, and by this process are redissolved periodically, these substances would be entirely lost to succeeding generations of plants and animals, and this constant drain from the resources now found on the surface of the globe would ultimately exhaust their supply and make life impossible.

That putrefaction and other processes of decomposition are produced by bacteria was suspected for a considerable time, but this was not definitely proved till 1875 by Menzel and subsequently verified by others. The action of these organisms is so variable that in the decomposition of any given substance probably a dozen species participate.

From this indisputable achievement of scientific research it will be seen that it is in the first instance entirely due to the activity of the minutest organisms that what is of earth goes back to it again by the dissolution into simpler substances of the complex and intricate combinations. Chemical action, no doubt, has also much to do with the redissolution; but it is now accepted that this activity in the generality of instances is secondary to the bacterial, and takes place after these have broken up the compounds.

Without the one process the other would not take place, and from this it is evident that micro-organisms are more closely connected with the productiveness of the soil than was dreamt of less than thirty years ago, and that not only in medicine and industrial pursuits but also from an agronomic point of view bacteriology is becoming daily of greater importance.

The organisms intimately connected with the fertility of the soil may conveniently be divided into two groups, namely, assimilating and destructive bacteria.

Under the first group we would classify the nitrifying and the nitrogen-fixing bacteria; and in the second all species which cause putrefaction and decomposition may be included.

The first group, as previously stated, includes nothing but beneficial species which are occupied either in building up nitrogenous compounds in the soil—the nitrifying species—or in fixing nitrogen from the atmosphere—the nitrogen-fixing bacteria—the latter of which, besides assisting plants to use this element, frequently also enrich the soil itself.

Important as is the numerous second group on account of the reducing power of its species, it includes several that act disadvantageously in regard to agriculture.

These objectionable species are the denitrifying organisms. By denitrification is understood the deoxidation of nitrates and nitrites, which in each case involves a loss by either nitrogen or ammonia being given off. Their activity is perceptible by the pungent smell of ammonia rising from fresh stable manure, particularly from that of horses. Nitrogen being odourless, its loss cannot be perceived by the senses; it nevertheless takes place to some extent during every process of decomposition where nitrogenous compounds are present.

The Aims of Soil Bacteriology.

It now remains to indicate the aims of Bacteriology in connection with Agriculture. These are shortly as follows:—

1. To encourage a definite multiplication of the nitrifying organisms found already in the fields, by adding substances that will enable them to retain their vitality and vigour after their activity ceases for the want of nitrogenous material; and in case of their absence from a soil to transplant them thereto, if this can conveniently be done, by adding soil impregnated with the desired bacteria.
2. To secure by the growth of plants favourable to nitrogen-fixing organisms an enrichment of the soil by nitrogenous compounds; and
3. To counteract the sudden and excessive development of the denitrifying organisms, in order to prevent loss of fertilising substances by means of these latter.

Durhams *v.* Jerseys.

A REPLY TO MR. A. WILLIAMS, OF TARRO.

D. HYAM.

IN his paper, printed in the May number of the *Gazette* from the *Maitland Mercury*, Mr. Williams contrasts the Jersey breed with the Durhams to the utter disadvantage of the former, in so far as their merits as a milking strain of cows are concerned. I would ask breeders of dairy cattle, before accepting Mr. Williams' *dicta* as gospel truth, to hear the other side of the question. As a breeder of Jerseys, my experience extends over the last fifteen years, and during that period I have had under observation, both in factory tests and in South Coast and Sydney Shows, most of the other dairy breeds. I feel, therefore, that I can speak with more than ordinary assurance upon the relative merits of the various breeds of milkers. I notice that Mr. Williams speaks only in general terms; he cites no tests in support of his contentions. In traversing his statements the figures I give can easily be verified.

Mr. Williams takes exception to the Jersey on account of her weakness of constitution and susceptibility to disease. My experience with the pure Jersey and the grade Jersey completely disproves this. I unhesitatingly state that they winter better than neighbouring herds, being more compact animals and better foragers, and require less feed than the heavier, larger-framed breeds. As to disease, I have never suffered the loss of a cow through condemnation by either local or Government inspectors. In the matter of size, while admitting the Jersey is not of the huge bulk of the heavy breeds, such as the Shorthorn family, yet their handy medium size is rather a recommendation than a detriment, as they consume less. My cows are certainly not "milking goats," as I maintain a robustness of character in my stock. I have no occasion to resort to "rugging"—a necessity with cattle of weak constitution.

Jerseys as short-livers.—I find that Jersey cows are not open to the charge of being short-livers. One cow of mine, "Fuchsia," when 19 years old, produced "Blanche," winner of two championships and one reserve championship at Sydney R. A. Shows. "Fuchsia" was at that remarkable age a profitable dairy cow.

Losses in calving.—My losses while calving total one heifer, in calf to a Shorthorn bull. If mated with a Jersey bull, the risk of loss while calving is no greater, if as great, than with any other breed. Losses in neighbouring herds of the large breeds, the Durham being fully represented, are of frequent occurrence.

Jersey bulls on the Richmond.—Mr. Williams states that "a Jersey bull could hardly be given away on the Richmond."

Some years ago, Mr. Alcorn, of Alstonville, purchased from me a Jersey bull, and at his clearing sale the stock from this bull brought higher prices than other stock at previous sales. Within the last eighteen months I have sold several young bulls to Richmond River breeders at prices up to 20 guineas.

Jerseys as milkers.—For the last seven years my cows (pure and grade Jerseys) have won all tests at shows on the South Coast, with two exceptions—one at Berry, and the other at Albion Park. The latter should have been secured for my cow, but owing to a mistake in conducting the test, the prize was awarded to another breeder. In the Shoalhaven Herd Book (open three years) my cows have been placed first in two out of the three years. On the first occasion, "Blossom," in 1898, won first place with a record of 20¼ lb. of butter per week; on the third occasion in, 1900, "Alice" won with 20¾ lb. per week. These cows were grass-fed. Other cows of mine have tested as follows:—"Dora," 17 lb.; "Sarah," 17 lb.; "Velvet," 16½ lb.; "Favorite," 14½ lb.; all grass fed.

To still further illustrate the productiveness of the Jersey, I give the following results from my cow "Blossom," a three-quarter grade Jersey:—

In October, 1897, from the Shoalhaven Herd Book, this cow yielded 20¼ lb. of butter for one week, equal to (say) 90 lb. butter per month. She was then tested at Berry Show in November, 1897, and yielded 27 lb. butter per week, equal to (say) 120 lb. butter per month. The next test was at Wollongong Show, on 1st February, 1898, when her yield was 22 lb. of milk, test 8·2; 2·115 lb. of butter, at one milking. At Nowra, the following week, 25½ lb. of milk, test 8·; making 2·303 lb. of butter from one milking—equal to about 20 lb. of butter per week.

Allowing 22 lb. of butter per week for the month of December, and 20 lb. for January (manifestly low estimates), this cow produced at least 484 lb. of butter in five months, and was then in full milk. Her yield next year, was even better; at Berry, 27¼ lb. of butter per week.

In quantity of milk I claim for the Jersey first rank, and I am never fearful of results at shows when quantity is to be considered, whereas the quality tests are indisputable. I have competed against all breeds on the South Coast, Durhams not excepted, and my success is a matter of common knowledge.

The dissemination of Mr. Williams' views broadcast throughout the country is in my opinion calculated to do harm, and I am impelled to write this reply from a conscientious conviction that he is doing injustice to an animal which I consider is, par excellence, the most profitable dairy cow, to wit, the Jersey.

Eggs in Cold Storage.

JAS. STEPHENSON.
Secretary, Board for Exports.

For some few years, in America and elsewhere, the preservation of fresh eggs from season to season by the process of refrigeration has been proven a financial success; and independent experiments in the Government Export Stores here during 1897–8 having established the possibility of adopting the same system with equally good results, the poultry raisers and egg merchants were invited to store in commercial quantities.

In 1898–9 a few of the more enterprising growers and merchants responded to the invitation, and there were stored some 11,000 dozen. During the present season the number rose to 93,600 dozen, about 100 individuals participating in the speculation. At the opening of the season the following circular was issued and widely distributed:—

NEW SOUTH WALES.

Department of Mines and Agriculture.
Board for Exports,
40, Young-street, Sydney,
August, 1899.

Cold Storage of Eggs.—Directions and Regulations.

For the information of farmers and others desirous of placing Eggs in Cold Storage during the spring and summer months, the following directions and regulations are published:—

Directions.

In order that eggs may be kept fresh and good for from four to six months, it is necessary to see that only *new-laid* ones be selected; where possible also it is advisable to have them *infertile*, as, when fertile eggs get exposed to a temperature of 98 to 100 degrees for even a short time, the germ will start into life, and no subsequent treatment will then avail to give them the quality of freshness. Eggs for storage should be gathered *every* morning, before the sun has gained strength, and placed at once in the storage boxes in a *cool* place. To attain the highest success, they should be *graded* as to colour and size, the boxes being marked accordingly. Care should also be taken to have them clean and free from unsightly stains. The *boxes* used should be of the usual trade size, holding 36 dozen, and packers should see that they are made of *odorless timber*, as eggs are peculiarly liable to absorb flavours from their surroundings. Another important point is to see that the boxes and fillers are *thoroughly dry* before using, otherwise mustiness is almost sure to ensue. Beyond the "fillers" of tasteless cardboard, *no packing* of any kind should be used, as the natural moisture exuding from the eggs should be allowed to escape, otherwise a musty flavour is likely to be perceivable when the cases are opened. Eggs for storage should be forwarded as soon as packed, by quick train or steamer, and handled on the way with the greatest care.

Regulations.

1. All eggs forwarded for cool storage must be sent, *carriage* and *cartage prepaid*, to the Government Export Depôt, Darling Harbour, and a letter or post card advising despatch posted to the Secretary's office at same time.
2. The cases will be received and stored on the owner's account and at his sole risk, and the Government will not be responsible for any loss or damage said to have occurred while the eggs are in store, from whatever cause arising.
3. Store receipts will be issued to the owner, or his agent, when the cases are deposited, and delivery will only be made on production of such store receipts and payment of all charges for handling and storing, as per schedule herein.
4. Cases must be of the kind known as "patent packers," each holding 36 dozen properly packed in cardboard "fillers," as supplied with the cases.

When the eggs have to come long distances, owners would do well to arrange for having them examined before being put into store, and all cracked ones removed, as no responsibility is taken for breakage or damage, and eggs coated with matter from broken ones may suffer injury if not cleaned.

Value of Cool Storage.

It may be mentioned that, during last season, over 11,000 dozen of eggs were stored at the Export Depôt on behalf of various owners, with the result that all those conforming to the above conditions were found *perfectly sound* and fresh at from four to nine months from date of storing. *The advantage of storing* is that when eggs are at their lowest they may be put away and kept until markets reach their highest, in April and May, when a profit of from 50 per cent. to 100 per cent. can be realized after paying all expenses.

Those intending to make use of the Export Stores during the coming season for storing eggs, are requested to *supply early information* as to their probable quantities, as it is anticipated that the space available will be fully occupied, and notice of early consignments is necessary also on account of the time required to properly regulate the temperature of the chambers.

Charges.

In order that small producers may have the benefit of the higher winter market, the charges have been fixed as low as possible, viz. :—

Receiving and delivering	3d. per case.
Storage per week...	3d. ,,

NOTE.—This means that eggs can be stored for 11 weeks at the cost of 1d. per dozen.

These charges are payable on delivery and include *storage only*; any cartage or carriage to or from stores must be paid by the owners.

Packing cases with fillers complete, may be purchased in Sydney at a cost of 2s. 6d. each

By order, JAS. STEPHENSON, Secretary.

The information given in this circular was based on experience gained during the preceding year's experiments, and was made as full and explicit as possible. Many of the depositors adhered closely to the instructions, and where this was done good results followed, but others, having failed to carry out some of the hints, were but moderately successful. The principal cause of failure was from ignoring the most important point of having the boxes and "fillers" *absolutely dry* before using. This neglect led to the loss of many dozens of eggs packed in some newly made cases, while exactly similar eggs packed in dry cases showed little or no damage. Some, again, put chaff or other packing material in the bottom of the case, thus attracting moisture and risking total failure; others were not sufficiently careful to store nothing but absolutely *fresh* and new-laid eggs, relying on the very inconclusive test of "candling" as to freshness. Mistakes of this nature lead to failure, and, what is worse, are liable to prejudice buyers against stored eggs.

Of this prejudice we have had considerable experience during the present season, and although many cases were sold at new-laid prices, especially when repacked by the owners before selling, others which were placed on the market just as they came from the store had to be sold at a heavy discount on fresh prices. A leading cause of this depreciation was the neglect of the caution conveyed in the following extract from a circular issued to all depositors:—

"It will be noticed that in taking eggs from the cool store the moisture from the atmosphere is apt to condense on them in the form of dew if the case be opened immediately; owners would therefore do well to give *two days' notice* prior to the removal of cases from the store, so that the eggs may be gradually brought back to normal temperature without exposure to the air."

Contrary to this advice, many of the owners took their eggs direct from the store to the market, when the dewy drops on them at once proclaimed them to be stored goods, and as, in addition, some of the cases made from damp timber showed traces of mould and smelt musty, the buyers naturally were cautious in bidding.

Notwithstanding these easily avoidable drawbacks, many of the owners express complete satisfaction with the result of the season's work, the following being extracted from one of many reports:—

"I have no hesitation in informing you that the storage has given me every satisfaction, and were it not for occasional breakages, either in transit or by handling, the loss in eggs would not reach one half per cent."

A few complaints have been received from depositors at a distance that some of the egg salesmen refused to handle stored eggs, but no doubt when the faults, already noted, have been remedied the prejudice will be removed, and stored eggs will take their place on the market at within a fraction of new-laid prices.

From sales reported, the following results have been obtained by various owners:—

A

Cost at time of storing	7½d.	per dozen
Storage (average twenty-nine weeks)	2½d.	,,
Handling and interest (say)	1d.	,,
Breakages (say)	1d.	,,
	1s. 0d.	,,

These were sold by the owner, who has a retail demand, at from 1s. 8d. to 1s. 10d. per dozen.

B

Cost when stored	8d.	per dozen.
Storage (average)	2¼d.	,,
Handling, &c. (say)	1d.	,,
Breakages (say)	1d,	,,
	1s. 0¼d.	,,

Sold in case lots at 1s. 4d. to 1s. 6d. per dozen.

C

Cost when stored	7½d.	per dozen.
Storage (average)	2½d.	,,
Handling, &c. (say)	1d.	,,
Breakages (say)	1d.	,,
	1s. 0d.	,,

Sold in lines at 1s. 2d. to 1s. 4d. per dozen.

D

Cost when stored	8d.	per dozen.
Storage (average)	2½d.	,,
Handling, &c. (say)	1d.	,,
Breakages (say)	1d.	,,
	1s. 0½d.	,,

These were bought from various sources and in some cases repacked after "candling." Sold from 1s. 1d. to 1s. 3d. per dozen, one lot realising as low as 10d.

In many cases the owners have not disclosed prices received, but it is significant that most of them express the intention of storing again next season.

Many inquiries are made as to the method of storing, temperatures, &c., and the following particulars may be found useful :—

The first requirement, and an essential one, is that the air must be kept *perfectly dry* ; experiments in chambers where this cannot be attained have invariably failed. The temperature must be regulated to as near 32° Fahr. as can be managed, the extreme average range throughout the room being 31° to 34°. Some ventilation must be provided, sufficient to carry off the moisture exuding from the eggs, otherwise deposition will take place on the walls or case, thus causing a moist atmosphere—a strong draught is unnecessary. The eggs must not be coated with any preservative which will close the pores of the shell, nor should they be washed. Washing is especially to be avoided, as it softens the pellicle within the shell, besides providing a suitable means of conveying the mycelia of various fungoid growths to the inner and tender portions of the egg. It has been observed, that, although usually the yolk does not change its position when kept at proper temperature, some samples which have been carried for long distances or over rough roads show a tendency in that direction. This is especially the case when the eggs are placed small end up, the air space at the larger end preventing the yolk floating to the top when stored with that end uppermost. Another noticeable point is that eggs from fowls fed on grain keep better and give better results than from those fed on soft food and scraps. This is probably the reason why duck eggs do not store so well as hen eggs, although it may be that some different conditions are required as to temperature or moisture. This point will be decided by experiment during the coming season.

It has already been mentioned that eggs for storage should preferably be infertile, but this is not absolutely necessary, as fertile eggs, if gathered daily in the morning and kept in a cool place, will keep nearly or quite as well, only should the germ be allowed to get the slightest trace of growth—even if undetectable by any known test—the keeping quality will be very much impaired.

It is found in practice that even when the temperature of the chamber comes considerably below the range given, the great majority of the eggs will take no harm, but when, as an experiment, some were placed in the freezing room at 10° Fahr., nearly one half were found to have cracked from the expansion. When, however, the cold is not allowed to come below 30° there is practically no risk.

It was noted that at 28° an egg, if cracked, would freeze solid, while with the shell unbroken it would remain quite unchanged. This was tried several times and always with the same result.

In most rooms with the dry-air system, it will be found that the side nearest the inlet ducts will have a considerably lower temperature than the other; the thermometer should therefore be placed at the colder point and not allowed to fall below 31°; a good plan is to put a lining of felt, refrigerating paper, or other non-conducting, odourless material along that side, about 4 in. from the main wall, and leave at least 9 in. between that and the stack of egg cases. The "patent" cases used in this market need no battens between them for ventilation, as the projecting ends at the top prevent their being stacked so closely as to prevent the necessary circulation of air. As to the space occupied for storing, it is found that a room containing 6,587 cubic feet will hold about 50,000 dozen, or about 132 cubic feet per 1,000 dozen.

The rates charged pay all expenses of storing and handling, the owners thus getting the advantage of holding over their eggs for a higher market at a low figure, but at the same time without loss to the Government or the general taxpayer.

From present appearances it seems likely that in a few years eggs, like butter or any other perishable commodity, will have but little range of price between the scarcest and most plentiful seasons of the year, and that, while new-laid eggs will always in future command 8d. to 9d. in the flush of the season, the winter price will recede from 2s. or 2s. 6d per dozen to the more easily reached figure of 1s. 6d. to 1s. 9d. retail. This will equally well suit all parties, as raisers will get a longer price when eggs are plentiful, and consumers will be able to enjoy the luxury of a fresh egg at a reasonable price all the year round.

It is only within the last three years that the possibilities of the poultry-raising business have been appreciated to anything like the extent they should be, and the successful introduction of the system of preserving eggs will have no small share in the success of the industry in future. Growers have only to exercise a very little extra care in following the advice given in the preceding pages, and we may expect, in the near future, to find a steadier and more remunerative market without the provoking fluctuations and losses of the past.

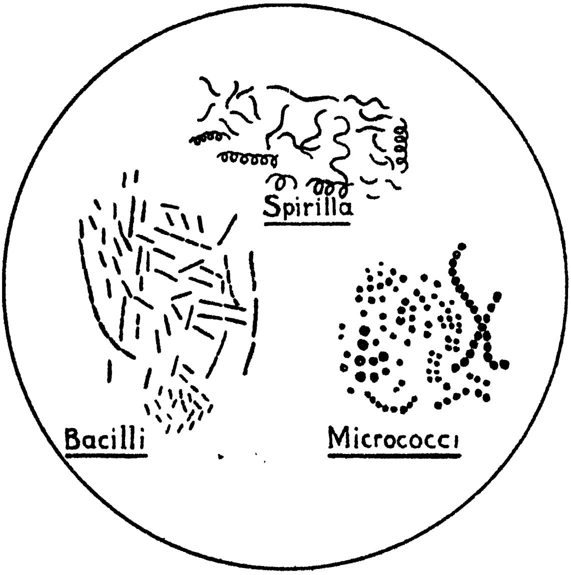
Something about Bacteria, Germs or Microbes.

In nearly every class of literature now-a-days we see references to bacteria, germs, microbes, or micro-organisms, and it may not be out of place to here reproduce, for the information of *Gazette* readers who have not time or opportunity to refer to regular text-books, some facts, supplied in a popular way, by Mr. H. H. Lamson, an eminent Bacteriologist, concerning these minute things that play so important a part in all or nearly all our operations. First of all what are they?

The Bacteriologist says:—

"Any one who gives the subject a moment's consideration cannot help being impressed by the wonderful variety of the plants which make up a grand division of living things known as the vegetable kingdom, but no one, who has not given special study to the subject, can have any adequate idea how great and how wonderful this variety is. Besides the plants which make up the greater part of the vegetation that clothes the earth's surface, and at the same time offer to man materials for food, clothing, houses, and innumerable luxuries, there are others which, while of the highest interest to the botanist or biologist, receive from the majority of people very little consideration, either because of their lack of economic importance or because of their small size, which renders, them difficult of observation. Such plants are the mosses, the lichens, the algæ, and the fungi, which are considered to occupy a lower position in the scale of vegetable life than those with which we are most familiar. Lower still than these is a group of plants which, although the smallest members of the vegetable kingdom, are far from being the least important. Not only are they of interest to the botanist, but more and more it is coming to be recognized that they are of great economical and therefore of great practical importance. These plants are the ones which are frequently spoken of as *germs*, *microbes*, or *micro-organisms*, and whose proper botanical name is *bacteria*—singular, *bacterium*. As has been intimated, the bacteria are the smallest plants of which we have any knowledge. Because of their extreme minuteness, their existence was not known until the microscope came as an aid and an extension to ordinary vision. After their discovery comparatively little information of importance in regard to their nature and function was acquired until the latter half of the present century.

"The form and structure of bacteria are extremely simple, and show so little variety that, in appearance, different species resemble one another very closely. Three principal forms are recognized: those which have the shape of little balls or spheres, known as *micrococci*: those which are elongated and round, like a short pencil, known as *bacilli*; and those which are spiral or corkscrew-shaped, known as *spirilla*. The illustrations show the different forms as they appear under a moderately high power of the microscope. Their size, though variable, is always very minute and even the highest powers of the microscope tell us but little in regard to their internal structure; therefore in studying bacteria and attempting to classify them, more attention is directed to what they do than to their form and structure; in other words, their physiological characteristics are of more importance than their anatomical ones."



Size.

" They are so small that from ten to twenty-five thousand micrococci would be required to form a chain an inch long; from three to twenty thousand bacilli placed end to end would only aggregate the same length. In a mass no larger than the head of a pin there would be several millions of bacteria.

Distribution.

" Bacteria may be carried from place to place in various ways, but their chief means of distribution is by particles of dust floating in the air. They are found in the air, in water, in the soil, on all surfaces exposed to the air, and especially wherever decay is going on, being themselves the active agents in producing it.

Food.

"The food of bacteria consists of organic matter, that is, of substances that form a part or that have formed a part of some plant or animal.

Moisture.

"Bacteria can thrive only where there is moisture; while drying does not necessarily kill them, it completely checks their growth.

"Some bacteria will grow only in the presence of oxygen; others only in its absence; while still others tolerate either condition.

Temperature.

"There is a certain temperature at which bacteria grow best; this varies in the different species, but for most lies somewhere between sixty and one hundred degrees Fahrenheit. As the temperature approaches the freezing point it becomes more and more unfavourable for them, and at or near that point all or nearly all cease to be active, though they may not be killed and may resume their activity when a higher temperature is restored. As the temperature rises above one hundred it rapidly becomes unfavourable; different species have different resisting power, but all or nearly all perish after a few minutes' exposure somewhere between one hundred and twenty and two hundred and twelve, the temperature of boiling water. The spores which some species produce are much more resistant than the bacteria themselves; this fact has to be taken into account in using heat as a disinfectant.

Reproduction.

"The bacteria reproduce in a very simple way; a given microbe divides into two portions, each of which becomes an independent bacterium; these two in their turn produce two each, and so on indefinitely. When the conditions are favorable reproduction is very rapid, so that in the course of twenty-four hours the offspring of a single bacterium may number millions. In addition to this method some bacteria form special reproductive bodies called spores, which serve the same purpose as seeds in the higher plants. Spores retain their vitality under conditions that would kill the microbes themselves." So much for their life-history.

The part they play in Nature.

Now "what is the role which bacteria play in nature? We know that plants and animals are continually dying; we also know that their bodies, after a longer or shorter period, disappear, leaving behind only a small amount of matter which finally becomes mixed with the soil, while the bulk of the substances composing them disappear as gases. None of these materials are lost, however, but somewhere and sometime they may and do enter into the composition of a new plant or animal. The chief agents in the production of this decomposition or decay of dead matter are the bacteria. They find in the dead organic matter the materials which serve them as a food and when the other conditions are favorable they develop rapidly. As a result of their activity the original compounds are broken up and new ones are formed, usually simpler ones. These various changes are spoken of as fermentations; when they are accompanied by the production of foul odors, as in the decay of animal substances, the process is termed putrefaction. Some of the new substances are useful, others are harmless or indifferent, while still others are violent poisons.

"Certain bacteria grow and flourish only under such conditions as are to be found in a living plant or animal; these are the parasitic or disease-producing bacteria. It is largely to the study of their relation to animal diseases that bacteriology owes its, in late years, rapid development. The disease-producing bacteria gain entrance to the animal body through the breathing or digestive apparatus or through wounds. In many cases where they gain entrance to the healthy body, though they find most of the conditions favorable to their development, they encounter a natural resistance which they are unable to overcome, and, as a consequence, perish without doing any serious damage. In other cases, owing to some unhealthy condition of the body in which the natural resistance is lost or weakened, the bacteria gain a foothold and develop, producing their characteristic disease. Tuberculosis or consumption, typhoid fever, diphtheria, cholera, lockjaw, anthrax, hog-cholera, and glanders are well-known examples of bacterial diseases.

"While the farmer or housekeeper may never have seen bacteria, or may even be ignorant of their existence, yet they do things every day the fundamental reason for which has to do in some way with these tiny plants. Food, after it is cooked, if not used at once, is reheated or scalded after a few days "to keep it from spoiling"; the original cooking destroyed all or most of the bacteria present in the material; after twenty-four or forty-eight hours the few germs that may have been able to withstand the heat used, or new germs that may have fallen from the air, begin to develop, and would soon "spoil" the food if they were not killed by reheating. The essential thing in preserving fruit, meat, or other food by canning is to destroy by heat all bacteria present and by sealing up while hot to keep out any new ones. Food materials are kept in refrigerators because the low temperature produced by the ice is unfavorable to and retards the development of bacteria. The temperature of ordinary refrigerators, however, is not usually low enough to wholly check development, hence the things spoil after a time. The reason for the various applications of heat and cold in the dairy may readily be inferred. Corn and other green fodder packed in the silo "keeps" because the packing excludes to a greater or less degree the oxygen of the air which is necessary for the development of the decay-producing bacteria. Certain substances, such as salt, sugar, smoke, are used to preserve food materials because they are unfavourable to the bacteria. The terms "pasteurization" and "sterilization" are frequently used in connection with the handling of various food products. A sterilized substance is one which has been subjected to a degree of heat, usually the boiling temperature, sufficient to kill all the bacteria and their spores which it may have originally contained. Many substances, *e. g.*, milk, cannot bear such a temperature without injury; a lower degree of heat, however, may be applied to them in such a way as to destroy most of the germs present, especially those likely to produce disease, without injury; this is pasteurization.

"Anything that kills bacteria is a disinfectant. One of the best disinfectants is heat at the boiling temperature or higher. Besides heat certain chemical disinfectants are in frequent use, especially in dealing with disease germs; the most common are corrosive sublimate, formalin, carbolic acid, fumes of burning sulphur, and chloride of lime. These are poisonous to animal life as well as to bacteria, and therefore must be used with care. A substance, which, while not necessarily fatal to bacteria, retards their growth, is called an antiseptic; sugar and salt, mentioned above, are such substances. Cold is to be considered as an antiseptic. Salicylic acid and boric acid are antiseptics which are sometimes used to preserve food; but any chemical food-preservative other than sugar and salt should be looked upon with suspicion as likely to be injurious to health.

"Leaving out of account the disease-producing ones, bacteria are of great interest to those engaged in agriculture, from the intimate relation they sustain to many of the operations which are continually in progress on the farm, some of which have already been hinted at. In dairy work bacteria in great variety have to be dealt with; not only is the souring of the milk and the ripening of the cream due to their activity, but various other changes, desirable or the contrary, are brought about by these omnipresent little plants. The milkman desires to suppress them entirely; the butter and cheese maker seeks to encourage the development of some species and to suppress that of others. In the manure pile myriads of bacteria are working, according to circumstances, rendering the contained plant-food more available on the one hand, or causing its loss on the other. In the soil they are working with the same variable result. Certain bacteria or bacteria-like plants grow on the roots of peas, clover, vetches, and related plants (the legumes), producing little nodules or tubercles; in some way they seem to enable the legumes to make use of a portion of the vast supply of nitrogen contained in the atmosphere, from which use most plants seem to be barred. As a more extended knowledge of the bacteria is acquired, it is more than possible that we shall be able to control their activity where heretofore it has been left to chance with variable results."

The City Agriculturist.

W. H. CLARKE.

II.

For the erection of boundary fences it will always prove a saving in the long run, and a source of satisfaction so far as appearances go, to employ a competent fencer. Nothing looks so disreputable or gives more trouble than the sort of fence an inexperienced man will put up. Some beginners, however, for obvious reasons, may have to fall back on their own efforts, and for their guidance, as well as for those who wish to undertake the personal erection of subdivision fences for fowl and horse yards, the following notes may be of interest.

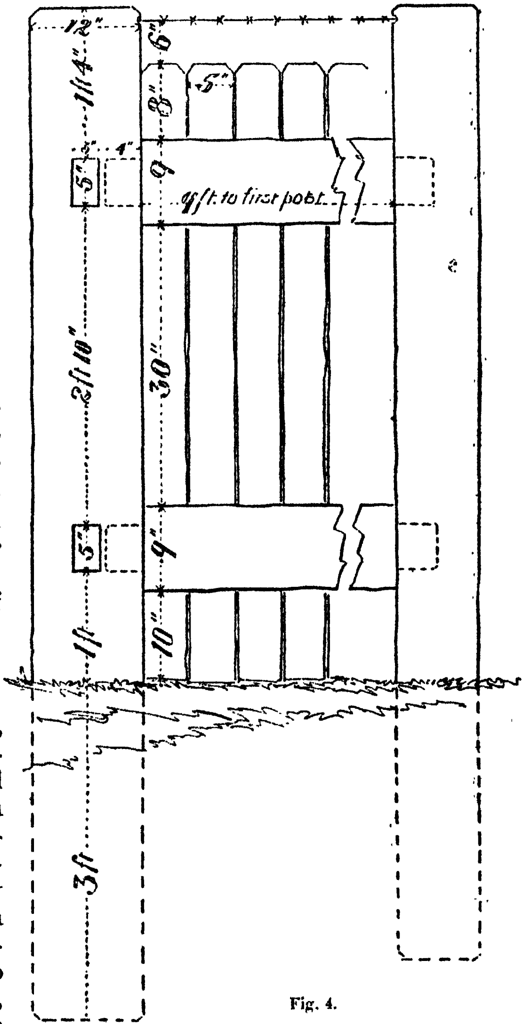


Fig. 4.

The kind of Fence.

As already mentioned, the class of fence will depend upon the material available, as well as upon whether it is to be permanent or not. Temporary fences are poor economy anywhere, but under certain circumstances, as for instance where clearing is to be carried out by degrees, the system is to some extent unavoidable. The most suitable boundary fence is one with posts standing above the palings sufficiently high to carry a barbed wire. For such a fence it is best to have posts 8 ft. 6 in. in length—2 ft. 6 in. in the ground and 6 feet out; and pailings 5 ft. 6 in., as shown in Fig. 4. Of course, the depth in the ground suggested may not be absolutely necessary for all situations. In stiff soils 6 or 8 inches less might be ample, but it is always easier to sink the post holes a few inches deeper at first than to make a good job of a sagging fence in time to come. Corner posts and gate-posts should be round, and for this purpose, during clearing, it is well to reserve nice cuts of blue gum, blackbutt, ironbark, or turpentine, of not less than 1 foot diameter at the small end, and 9 feet long. The bark should be removed at once, the top neatly trimmed with an adze, as shown in Fig. 4, and then the posts should be stacked off the ground and covered at the ends with bark or bushes until used. If allowed to lie around exposed to the sun for any length of time, round stuff will split badly at the ends. The neatest post for the fence under notice is one 9 in. x 4 in. Some people favour heavier posts, but there is really nothing gained by extra heavy fencing material which often sags out of position by reason of its own weight; on the other hand, some advocate 6 in. x 3 in. posts, but that is cutting things a bit too fine for paling fences. The most durable fencing stuff is that split from large trees, but the difficulty of bursting big logs and handling them is most likely to drive the beginner to smaller trees.

Splitting.

We may have a tree of one of the varieties already mentioned as suitable for splitting, about 2 feet in diameter at the butt end, and which, according to tests, such as appearance of chips and readiness with which they split, is likely to yield straight material.

First of all measure off with a stick cut to desired length, say 8 ft. 6 in. for posts, or 9 ft. 8 in. for rails, commencing at the butt and not going beyond the first fork. Say the trunk is about 27 feet long; that will allow for three cuts of posts, or two cuts of posts and one of rails. Small straight trees and the higher cuts of larger ones make the best rails. Last month in an illustration of tree-hauling tackle, a number of logs were shown placed across the direction in which the tree was likely to fall. The logs by supporting the trunk will enable the sawing into posts or rail lengths to be effected with freedom. If the trunk is lying quite flat, which in the case of a well grubbed tree is scarcely likely to happen on account of the projecting butt and heaps of excavated earth, the saw is kept free by inserting a wedge in the cut as soon as the saw begins to jamb, and tapping it home from time to time as the cut deepens. But in the other case, having supported the trunk, so that as the cut proceeds the sawn ends will gape instead of biting, remove a ring of bark at the marked places and go ahead. It will be observed that an experienced sawyer never "worries" his saw, *i.e.*, presses at it or jabs it on the wood, but steadily draws it back and forth, allowing the saw to cut by its own weight and the set of its teeth. These are seemingly unimportant trifles, but they are such that the proper observance of means the difference between steady, rapid work and fair bullocking with small results.

As soon as your trunk is cut into lengths, strip the bark. If the tree is only recently felled, black-butt, mahogany, and turpentine will strip like stringybark, and sometimes yield a few good sheets. If, however, the trees have been on the ground for any length of time, stripping in sheets will be either impossible or very difficult. In the case of bloodwood and ironbark the bark is best beaten off in chunks with the back of the axe.

Having the log clean, roll the butt end of it against a stump, or something that will keep it in place, and stick a small log under the small end to raise it an inch or two off the ground. Now we are ready for splitting and will have a look at the tools to use.

A maul is usually a home-made affair. A piece of curly grained ironbark timber about 10 inches long and 5 inches diameter is used, as a rule, with iron rings, and a tough but thin handle. For this purpose, a turpentine sapling, stripped of its bark and dried by means of hanging it in the wind for a week or two, cannot be beaten. The rings costs about 1s. each, and can be purchased at almost any ironmongers.

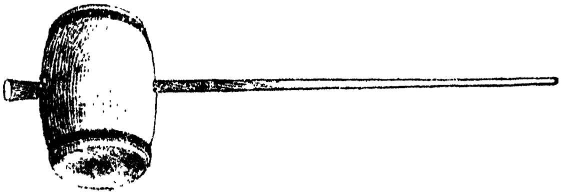


Fig. 5.

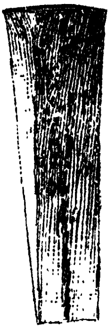


Fig. 6,

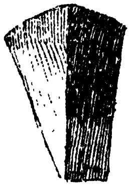


Fig. 7.

The handle-hole is bored right through the maul, and the small end of the handle is drawn through so that the head can never fly off.

All sorts of wedges can be purchased at about 4d. a lb., but it is well to choose those tapering gently to a fine point [Fig. 6] rather than bluff cheeked ones, [Fig. 7] which, among other disadvantages, are hard to get started in the wood, and fly out at unexpected moments; whereas the slender ones, which are made just as thick at the end, may readily be started in, and will not fly out.

Having the log to be split in position, [Fig. 8] mark a nick carefully with a small wedge and mallet across the diameter *ab*, and drive in a wedge at *c*, and another at *d*. Drive these about half way home, which should start the log on top. Put a wedge in at *e*, *i.e.*, as far up as the split extends, and drive it nearly home. This will release *c*, which can be put in at *f*, and driven in half way. Then drive home *e* and *f*, and if the log means "split" it will begin to gape.

If the wood is woolly, and rends with difficulty, it may be necessary to use the axe a good deal to cut away the strands of splinters that hold it together.

Having divided the log into halves, measure off for the post widths. Make all measurements from the small end, and subdivide accordingly, always remembering that it is better to split off one good post that can be trimmed down to the desired size than two skimpy ones that are useless.

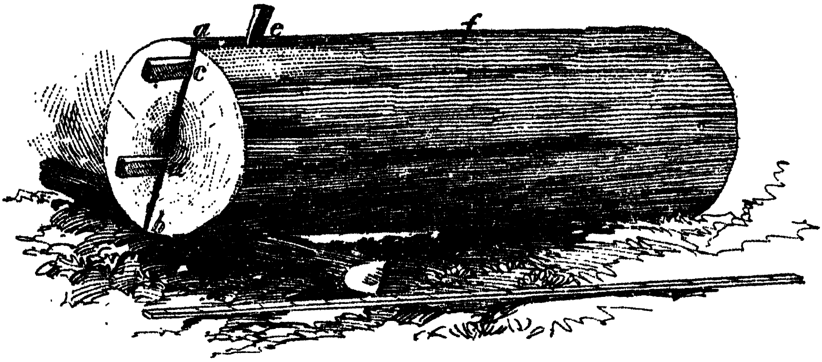


Fig. 8.

The heart wood can readily be backed off by driving in the wedges flat, and using a stout stick as a lever. Indeed, in splitting operations, about one-third of the belting and sweating may be saved by the judicious use of a lever. In the case of big logs, great execution can be done in this way.

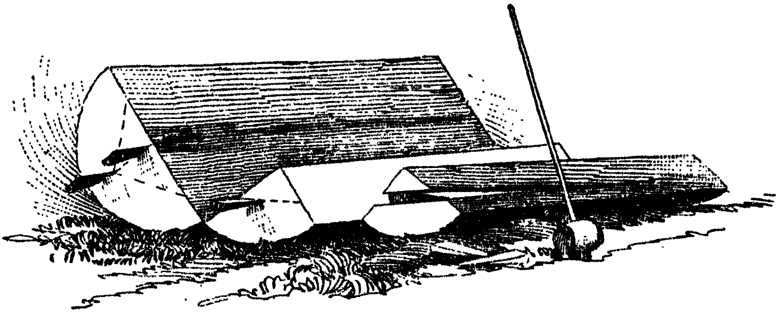


Fig. 9.

A 2-foot log ought to yield from two to three posts deep, and if the subdivisions are carefully made, each post can be backed off in the same way as the heart wood is removed. To keep the split within the desired lines, nick the wood with a wedge or the axe.

Preparing the Posts.

The sooner after splitting that the posts can be mortised the easier the work will be.

Great care must be taken in measuring out the places for mortises, and all calculations must be made from the top of the post.

For instance, for a fence like the one illustrated [Fig. 4], so as to allow for the projection of a 5 ft. 6 in. paling 8 inches above the top of the top rail and 10 inches below the bottom of the bottom one, and coming flush with the ground, it will be necessary to have a space of 34 inches between the bottom of the top mortise and the top of the bottom one. The holes are usually made 5 in. x 3 in. (or 2½), so that the top of the top mortise will be 16 inches from the top of the post.

A good plan to prevent the possibility of error in marking out is to get a piece of 3 in. x 1 in. softwood batten about 5 ft. 6 in. long. Drive a nail through one end so it will catch on the top of the post as shown, and mark off the distances on it [see Fig. 10.] For the fence in question, the distances would be as shewn in Fig. 10 :—

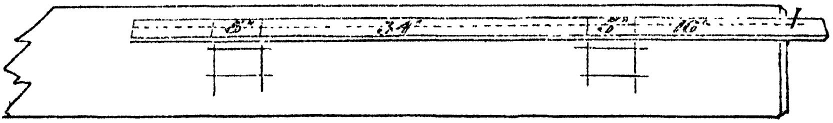


Fig. 10.

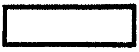
The holes are made either with a mortising axe, or by boring with an auger or boring machine and cutting out with a chisel. The first method is by far the simplest and quickest, but it is necessary to be an expert axeman to make anything like a decent mortise. In this method the smooth side of the post is attacked first, the top and bottom cuts being made with the hoe blade, and the picking out being effected with the axe blade. When about half-way through, turn the post and mark it off with the stick as before, taking particular care not to cut too far to one side or the other. If this is done carefully the cuts will meet, and the mortise will be clean and true. Nothing so weakens a fence as chawed mortises. If one does not feel up to manipulating the mortising axe skilfully, it will pay to get an experienced man, or to bore the holes with an auger, cutting out with a chisel, rather than make a dog-gnawed job of it.

If an auger is used, do not attempt to work with one that is too wide, which is slow and laborious. One of the most profitable investments a person with a new place can make is in a boring machine. It does not cost much and will carry bits of all shapes and sizes.

When the post is mortised take the adze and trim it up a bit, nick off the top corners and trim the rough edges off the side that is likely to stand outwards. This takes only a few minutes, but gives a satisfactory finish to the fence. That done, build a fire and pack the ground ends of the posts in so that they may be charred well. When this is carelessly done, and uncharred patches are left, it affords the white ants opportunities of attack.

While it is a good plan to get the posts ready in advance, it is not much use doing anything to the rails until erection of the fence commences.

Erecting the Fence.

About the most difficult task in erecting a fence is keeping the line straight. There are various ways of doing this; but, where the area is small, one of the simplest plans is to put in one corner post permanently, and use it as a starting point. Say the area is square or oblong, put in the north-west corner post, then go to the south-west corner and put the corner post in position there, but do not ram in the earth, just prop it securely in place. If the line is a long one put a few straight poles at intervals between the two corner posts. Then with a nine-foot measure stick mark off the place for the first post from the north-west corner, and dig the hole. In doing this do not make it square or round, but oblong—the width of a spade or shovel, but about 2 feet long, so 

From a hole this shape it is far easier to lift the earth than from a square one, and it is needless to say that the aim is to make the hole big enough to permit of ramming, and at the same time not to increase the work by lifting out more earth than is actually necessary.

For sinking and ramming post holes, a bar with a chisel blade at one end and a rammer at the other is indispensable. Some of the bars sold are needlessly heavy. There is nothing gained by using a tool that pulls one's arms out of joint, never mind whether a man is constantly or temporarily engaged in manual labour. Having got the hole ready put the post in and shoulder the rails, taking the wood off carefully and leaving a good shoulder on the top and bottom side. That done, put the bottom rail into the mortise of corner post first and then into No. 1 post; then do the same with the top, as shown in Fig. 11. This is the rule in fencing, to always put in the lower rails first.

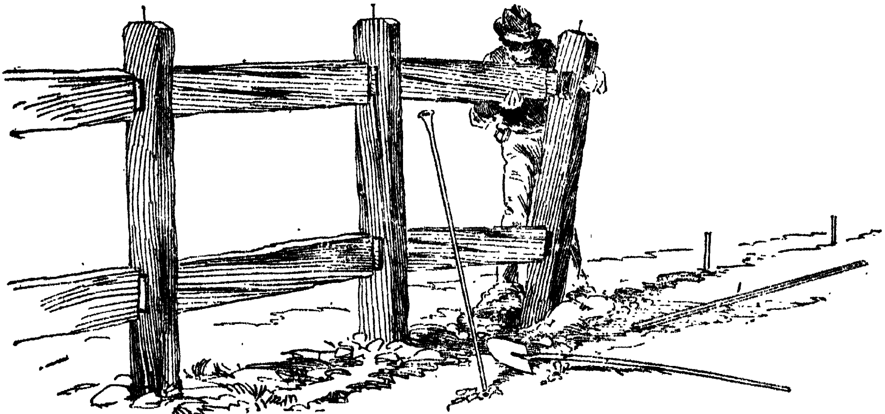


Fig. 11.

Now you will have the first panel in place but not in position. Stand behind the corner post and get the loose post exactly in line with the other corner post and markers, as well as along the top. When that is done and the post is standing on a level floor, throw in a little earth at a time and carefully ram it quite hard, filling the hole evenly all round the post by degrees and tamping each lot thoroughly. Do not under any circumstances fill in the hole all at once and ram then. It will be bound to work loose and sag, which will also happen if the hole is filled with large pieces of stone. A properly rammed post hole should contain nearly every scrap of excavated earth. If the hole has been made too deep, and it is necessary to put back some earth to level up, ram it down well before placing the post on it. The first panel being in position, measure off and dig the hole for the next post. Shoulder and trim the rails, taking particular care that they fit nicely into the mortise which is already half occupied by the others. Then get post No. 2 into the hole, fit the rails as before, and work it into position, keeping it not only straight with the markers but straight along the top. If care be taken in this latter respect the fence will be found to follow the contour of the land, and will rise and fall in almost imperceptible curves, whereas if such details are not attended to you will have a fence like home-cut hair. When one side is finished work for the others will be carried out in precisely the same way. If you come to a stump or big loose stone and have to remove it do not put a post in the refilled place for a few days or until the soil has settled. Such a blank need not stop progress, because when the post is put in, rails from the posts on either side of it can be fitted in before it is rammed. If a large rock is encountered, and the hole cannot be sunk more than a foot or so, dig a trench at right angles to the line and mortise, or let the foot of the post into a log with a diagonal strut on each side. So much for the posts and rails, except that where white ants are to be feared it is not a bad plan to keep a pot of crude kerosene oil by you, and as the rails are placed in, swab the mortise holes and butts of the rails.

Putting on the palings is simple. To give them a finish nick the corners as shown in Fig. 4. To get them nice and straight fasten a string 6 inches down from the top of each post and keep to that. The bottoms will take care of themselves.

A Wire Fence.

For wire fences the most important things are the corner and straining posts; the intermediate ones need not be as heavy or as long as for paled fences. The corners, strainers and intermediate posts usually 10 feet apart, should all be put into position before they are bored for the wires. Where very heavy posts are used it is sometimes difficult to get them into the hole without plenty of help. One plan is to dig the hole rather long, put a couple of smooth saplings or a board at one end of it very slightly on the slope. Roll the post up so that the foot of it lies over about one-third the length of the hole. As it is raised from the upper end it will slide down till it is checked by the saplings, which are gradually wriggled out, thus letting the foot of the post down till it reaches the bottom of the hole. Once in it is easy to work it into position with levers. When the posts are in position they are bored for as many wires as desired. A stick similar to that used for marking off places for mortising, is good for getting the wire-holes truly in position in each post. Say the posts are 5 ft. 6 in. high and four black wires are to be used, a foot apart; put a nail in the stick so that it will catch on the top of the post and hang

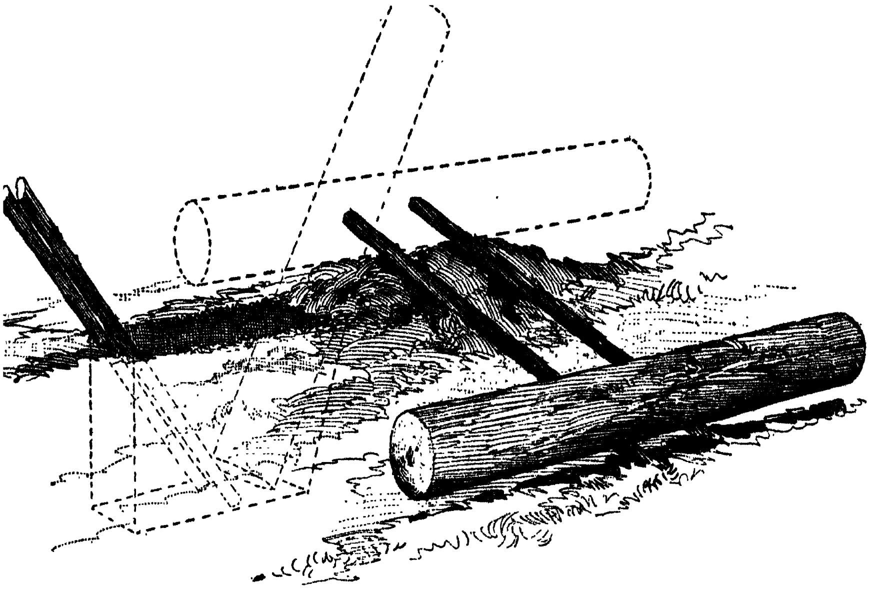


Fig. 12.

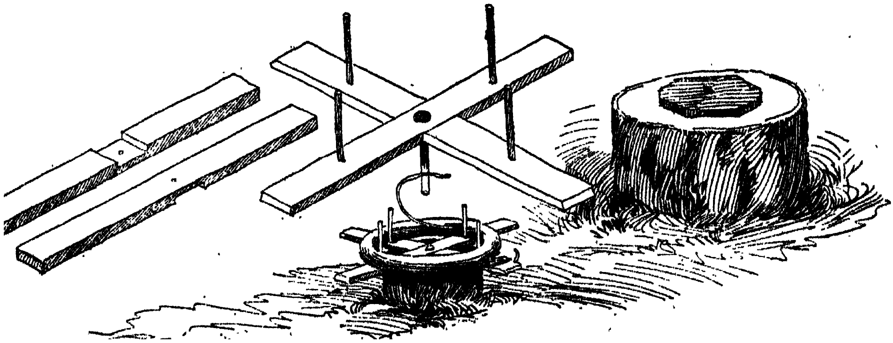


Fig. 13.

down with the places measured off on it; hang it just a little aside from the middle of the post, and at each mark bore a hole with a brace and ⅜-inch bit. Done in this way the boring will be perfectly regular in each post, and the wires will come directly under each other. No matter if the distances apart are exact, if the holes are not plumb the wires will have a peculiar appearance.

In getting in the wires trouble is often experienced by the wire flying out of the coil and getting kinked in all sorts of fantastic ways. A device, which the writer has found good, to prevent this is made as follows:—Take a couple of pieces of sapling, or 3 x 2 sawn wood, and make a cut across, letting one piece into the other, so that it will be level; bore a hole in each arm to hold a peg about 15 inches long; bore a hole through the centre large enough to allow a long bolt or iron peg to work freely; set the cross on a solid flat piece of wood, say a foot cut off an 18-inch log, with a hole in the centre to carry a bolt; put a piece of well-greased board between to act as a washer; then, as shown in the diagram, set the coil of wire on the roll, fastening the inner end to one of the pegs; stand this about 20 feet from the first post, and as hole after hole is threaded the coil can steadily revolve and pay out the wire. Cut the little wires binding the coil with the run of the wire. If a file is used be

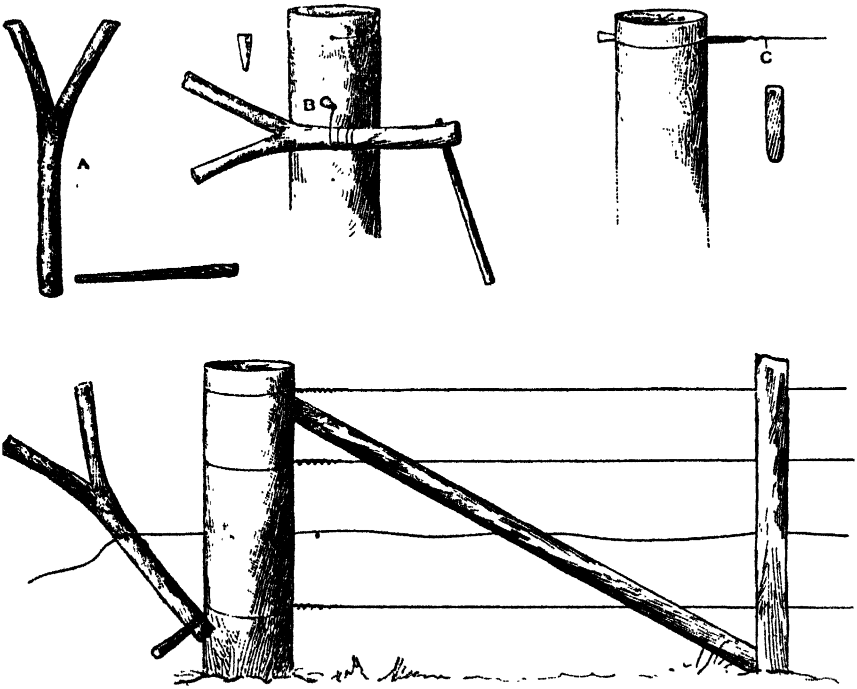


Fig. 14. Straining the wire [p. 570].

careful not to cut or nick the wire across. The slightest injury to the "skin" may weaken it and cause it to snap when a strain is put on. In unreeling in the ordinary way commence from the inside of the coil.

For straining the wire a plan that can be recommended is that now reproduced from the *Farmers' and Fruit-growers' Guide.* As shown, the apparatus consists of a forked stick through the stem of which a ½-inch hole is bored close to the fork to carry the wire and a larger hole is bored near the end for the insertion of a handle.

The wire to be strained is permanently secured at one end by turning about about a foot over and winding it by means of a little piece of flat iron, as shown. Stick the length to be twisted through the hole as far as it will go and turn the iron from you. This will result in a neat job that will never come adrift. That done go from panel to panel and stand on or pull the wire so that when the straining post is reached, it will be fairly taut. Cut off the wire (a triangular file is the most suitable thing to do this with) and put the end through the hole in the forked stick. Wind the fork round and round until the wire fairly hums. Then jamb the fork so that it cannot unwind and drive into the post hole an iron pin—a sailor's marling spike is the most suitable—to hold the wire whilst you unravel the end from the fork. Then the end is carried around the post neatly and as close as possible and twisted as described above. When the tie is made, the spike can be removed and you are ready for the next wire.

If a wire gets broken or it is necessary to slack off the wire to fall a tree, the little flat piece of iron comes in handy for unwinding the tie. Broken wires can be repaired by freeing one end and rejoining in a figure of 8 or a reef knot, but the simplest and most satisfactory plan is to make a loop joint by turning over and twisting into a inter-loop the ends of both pieces of wire.

(*To be continued.*)

DRILLING *v.* BROADCASTING WHEAT.

MR. W. W. KILLEN of Bull Plain, Corowa, writes: "It will no doubt interest you and some of your readers to know the result of drilling in wheat, as compared with broadcast sowing here last season. About half of 2,200 acres sown was put in with 'Quaker' drills (which by the way did the work splendidly) and the result showed unmistakably in favour of drilling. As a test I sowed about 25 acres of wheat alongside an equal area drilled, without manure or any fertiliser, at the same time, and the same variety of wheat—in fact the conditions were exactly similar, except that the quantity of seed broadcasted was about 45 lb. per acre, and quantity drilled about 25 lb. The result of the stripping of these two areas was that the drilled portion beat the other by 25%. As to quantity of seed required other experiments which I tried, of sowing with the drill from 15 to 30 lb. per acre, convinced me that 20 lb. is an amply thick seeding, and I think 15 lb. if sown early is sufficient."

The Hatching Season.

J. J. McCUE.

Each year finds the poultry-industry getting further and further away from the old methods; especially is this the case with incubation. The natural method of incubation is superseded by incubators, of all makes and sizes, from the "Bantam" of a dozen eggs up to "Incubator houses" of 25 to 30,000 eggs. The poultry-industry of modern times has called in the aid of artificial methods for incubation, the old-time broody hen being used only in a small way. In using the hen the rate of increasing numbers is too slow; besides, we cannot get broody hens early in the season, when we wish to incubate early eggs, to produce early layers. Another serious drawback with a hen early in the season, and at other times, is, that she often forgets to return to the nest, breaks an odd egg, and never forgets to hand down her legacy of vermin to her children.

With incubators, we seldom find them neglecting the eggs, if we attend to their food—oil. We are certain they will go broody for us at any time, if we supply the heat and attend to their requirements. We are also certain that the chickens hatched will be perfectly free from vermin of all kinds. Another point in favour of incubators is the easy management of the chicks—100 incubator chicks are as easily attended to as ten with a hen. It would require eight hens at least to properly care for 100 chickens, which would mean eight separate lots to water, feed, and attend to. Then there is the risk of one hen's chickens getting into another hen's coop, and the result is usually a wounded chick, or a dead one.

Incubators.

There are several kinds of incubators, and if you follow the majority of circulars issued with each machine, you will read: "If instructions are carefully followed, the machine will hatch 100 per cent. of chicks." Well, sometimes an incubator does give a percentage of 100 chicks, but it "spells" a long time before it tries to do it again. One hundred per cent. hatches are accidents—not the regular percentage at all. A hen, the surest incubator, seldom gives a hundred per cent. The man or woman who runs an incubator from June till December, and averages 75 per cent., has proved that the fertility of eggs was good, that the machine was good, and that the person who ran the machine was good, and no novice at artificial incubation.

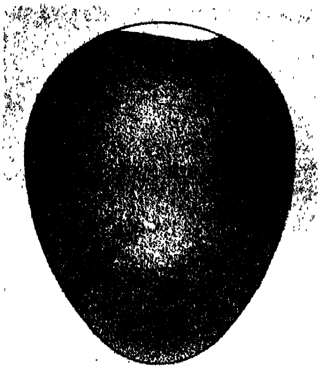
In choosing an incubator, beginners in poultry-breeding have much to contend with. They cannot really choose or realise which make is the best; they generally depend on a friend's advice, or upon catalogues that state 100 per cent. hatches, if you use their machine. There are several makes of good incubators, and to secure one of these a fair price must be paid; the cheap machines cannot have the proper timber and other required parts that are used in the fair-price machines. A cheap machine means cheap timber, cheap pipes, cheap lamps, cheap regulators, and last, a greater consumption of oil than the fair-priced machine.

There are incubators that give good percentages, but when compared with other makes, equal in percentage of chicks, they fail in the cost of running the hatch. I am using machines that cost twice as much for oil as other machines alongside them. A good incubator should heat the eggs in as cheap a manner as possible, and be regulated so that there will be as little variation as possible. It should be built honestly; all materials used should be of the proper kind and of best quality; all joints, soldering, &c., should be done in a true workmanlike manner. It should be so constructed that a constant supply of fresh warm air can be passing through and around the egg-drawer, at the same time keeping up a true, even temperature. The machine should show no variation in temperature in any part of the egg-drawer. Another point, the system of regulating the machine, should be simple and accurate, for this is one of the most important parts of an incubator. An incubator should be raised some distance from the floor of the room. A fair height is to have the egg-drawer 2 ft. 6 in. or 3 feet from the floor. Never place an incubator in a stuffy corner of a room, or in draughts; an incubator, to give good results, must have a free circulation of pure air—not draughty—all around it. Before placing an egg in the incubator the owner or attendant should see that it is perfectly level and firm; there must be no rocking or shaking in the machine when you take out or replace the egg-drawer.

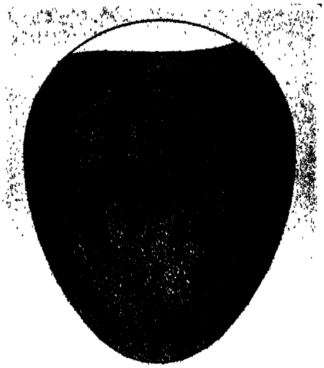
Management of an Incubator.

After the machine is in position, firm, and perfectly level, the next duty is to start the lamp. This should have a good wick, neatly trimmed, and the oil used must be of the best quality; cheap or inferior oil causes bad results and bad tempers. Much depends on the lamp; have this in perfect burning order always, and success will follow. The regulating system must be steady and accurate before an egg is placed in the drawer. It is bad work to start a machine and place eggs in it as soon as the temperature rises to 103 deg. F.; wait for twelve or twenty-four hours to test the steadiness of your regulator.

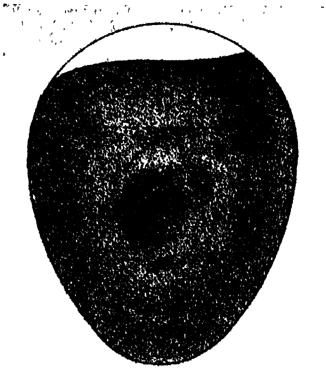
The proper heat to incubate eggs is as near as possible 103 deg. F.; a little lower, 101 deg., is about the correct temperature for machines that have tanks over and below the egg-drawer. The instructions sent out with each machine generally give full particulars how to manage and run the incubator properly. Yet there is one thing that some of these instructions do not give, and that is the conditions



Fresh egg.

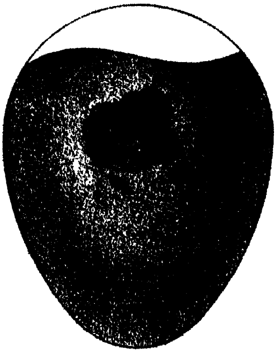


Infertile egg.

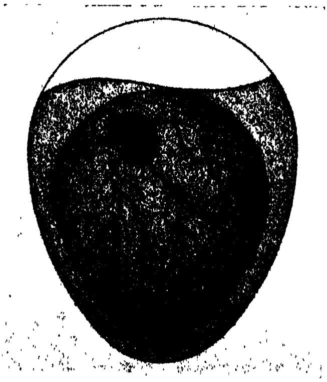


Air chamber varies in size, at times to nearly half the size.

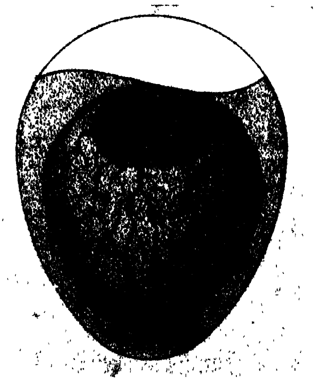
Addled.



Dead germ.



Fertile egg—5th day.



Fertile egg—7th day.

under which the incubator should be run when placed in a room that is very irregular in temperature. Of course, they all say, "Keep to proper temperature," but that is the difficulty. For instance, you regulate the lamp in the morning; it keeps an even 103 deg. up till (say) 7 or 8 p.m.; then the outside night temperature lowers it to 98 deg. or 99 deg., and in some cases you will find the thermometer in the early morning registering only 75 deg. or 80 deg. Of course, this does not happen to all machines or rooms either; still, one of our best incubators has this fault, for it is made of very light material—in fact, built for a perfect incubator room. Now, we all cannot afford to build rooms with little variation of temperature, so the next best thing to do if our machine falls in temperature during the night is to cover it with rugs or blankets of sufficient thickness to keep the eggs at the proper temperature.

The following temperatures will be found useful to those who use incubators:—

60 degrees F. is the best temperature to keep eggs for setting.
85 „ F. will start the circulatory system.
95 „ F. will start the germ growing, and show red blood colour in egg.
120 „ F. will kill the germ of a duck or hen's egg.

Too low a temperature produces addled eggs; too much heat produces dead birds in egg; and bad ventilation, damp room, too much moisture, uncertain and bad results.

In selecting eggs for the incubator, choose those of a normal size, good shape, as fresh as possible, and from strong, vigorous parents. It is only wasting time, labour, and money to try to hatch a good percentage of healthy chicks from weak parents. The older the eggs the later and more irregular the hatch; the fresher the egg the earlier and more regular the hatch. A week or ten days is the longest eggs should be kept, though eggs will hatch after being kept thirty days if their temperature has not varied much from 60 deg. The strength of the germ weakens after the egg has been kept ten days; besides, it may die in the egg before incubation starts, just as it often does after incubation has commenced.

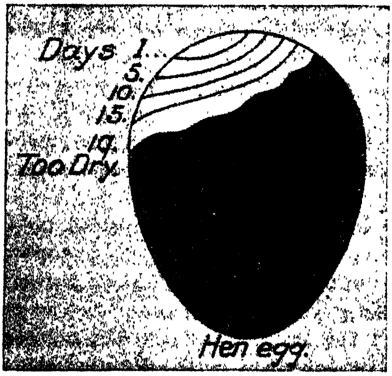
Turning and Cooling the Eggs.

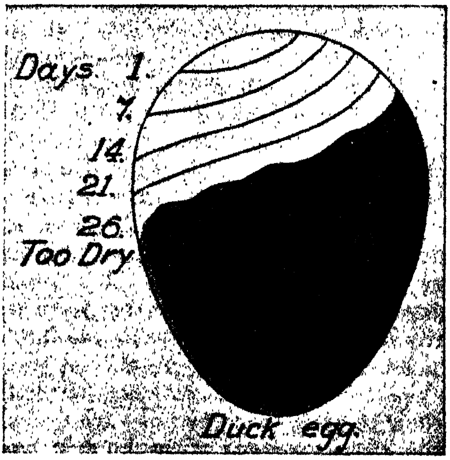
Eggs do not require turning till the fourth day, and should be turned regularly every twelve hours up to the nineteenth day for hen eggs, and the twenty-fifth day for duck eggs. Cooling the eggs should commence and finish with the turning—that is from the fourth day to nineteenth for hen eggs, and fourth to twenty-fifth for duck eggs. The cooling should be slight at first, and gradually increased as the incubation of the eggs proceeds. I seldom give much cooling to the eggs, only what they receive while I am turning them, till after the second testing—the tenth day.

Moisture.

This has been the trouble with incubator users for many years, but careful poultry-breeders and incubator makers have nearly overcome the difficulty. The ventilation of the incubator has much to do with moisture. If the machine is made with large openings for ventilation the moisture is reduced, and if made with small openings the moisture is increased. The secret is to get this perfect ventilation. Well, our only chance is to test for it ourselves, for incubators and rooms differ.

If we watch the air cell of the incubated egg, we will find that it enlarges as incubation progresses. In the accompanying diagram I have given the time and stages that the air bubble increases during a proper incubation. In testing your eggs on the fifth or seventh day note the size of the air cell, and if similar or very near to day on diagram, you will know that the incubation is going on alright. On the other hand, if the air cell is larger, then you are "drying off" too quickly; and if it is smaller, you are not "drying off" quickly enough, so should give more ventilation and cooling, and the opposite if air cell appears to be too large.





The air cell of the egg is the best moisture measure that you can get. If this is carefully watched, good results should be the repayment. Sometimes you may run the incubator for the whole time of incubation without using moisture in the trays or pans, and get splendid results; at other times you are compelled to use the moisture pans and attend to ventilation to give the proper amount of moisture.

Testing the Egg.

Every person who wishes to be successful with an incubator should become acquainted with the development of the germ and the growth of the embryo. With a good tester you can follow the interesting stages of growth for days, and by making a note on the egg in pencil a novice will gain much information that will be useful to him in artificial incubation. The development of the chick is curious, and

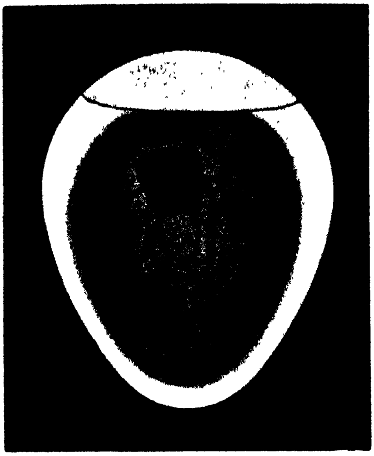


Fig. 1. A fertile egg, 5th day.

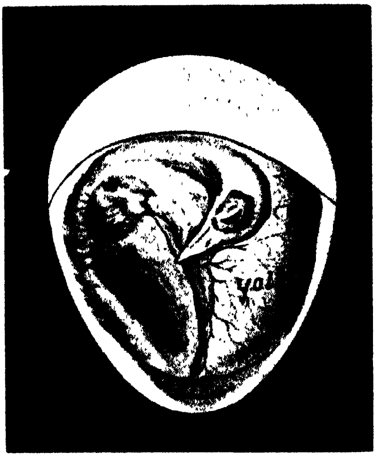


Fig. 2.—10th day.

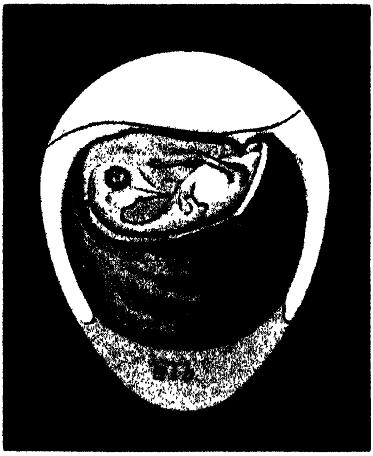


Fig. 3.—13th day.

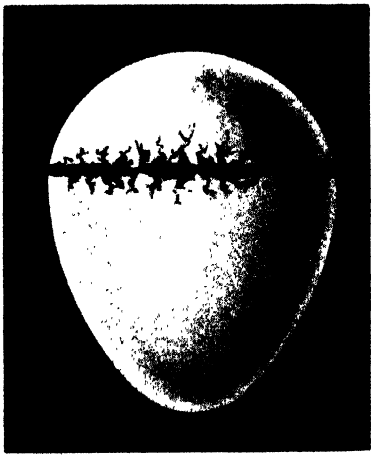


Fig. 4.—20th or 21st day.

well repays the time spent in the study of it. Many poultry-breeders and beginners in artificial incubation do not take the proper interest in the development of the embryo; they are under the impression that the incubator "does it all"—that their only duty is to keep the egg in a proper temperature.

In testing your eggs for fertility you are also testing the laying condition of your breeders. If you get a test of 75 to 80 per cent. of fertile eggs your breeders are in good laying condition. If the fertility runs below 60 per cent. then the breeders are not in proper condition. Very often we find eggs only partly fertilised. They appear on first test to be all right, but later we find the germ has died. Such eggs should not be allowed to remain among the others, or, as they decompose they may spoil the adjoining eggs. An infertile egg will remain almost perfectly clear, and will not decay if left in the machine; yet it is best to test these out on the fourth or fifth day, when they may be sold as "case eggs" or kept to feed the chicks or ducklings for their first few days' meals. Hen eggs can be tested on the fifth and tenth days, duck eggs on the fourth, seventh, and fourteenth. Remember, by carefully notifying the different testings of the eggs during incubation, the owner will be in a position to tell *what moisture is required for best results, and what condition his laying stock is in.* Duck eggs hardly hatch as well as hen eggs, for the reason that breeding ducks are liable to get too fat for a proper egg-production. Duck owners should feed properly, if they wish for a good percentage of fertile eggs. Ducks, with all our care, do not *exercise* themselves like the hens; therefore our only chance is to feed properly.

In the first part and end of the season, the eggs of hens and ducks are not so fertile; therefore we must not expect 75 per cent. hatches every time. Many early eggs are only partially fertilised; therefore, many die during the early stages of incubation. In selecting eggs for incubation, do not use bad-shaped or very small eggs from any variety of poultry, neither should you use abnormal sized eggs or long narrow eggs that are not the normal kind that the variety lays.

It may seem very strange to many that brown-shelled eggs should not be incubated with white-shelled eggs. Leghorn and other white-shelled eggs "dry off" more quickly than brown-shelled eggs, so if you incubate the two side by side the moisture required for the one would be unsuitable for the other. I know that many poultry-breeders do mix the two coloured eggs, and often get good results; but if they incubate the two separately they will get better results.

All eggs intended for incubation should be perfectly clean, handled carefully, and if to be kept longer than seven days, should be shelved with the small end up, and at a temperature of as near as possible 60 degrees.

Brooders, or Foster-Mothers.

All who use an incubator should have a brooder, and the size and make will depend on the number of chicks intended to be raised in a season. There are several kinds of brooders, as well as there are of incubators. Some are hot-water brooders; others hot-air. A good brooder should be always dry, warm, and clean, and so heated that the temperature will not vary more than three or four degrees at most. Unlike the hen, the foster mother is always ready to brood the chicks at any time, and has no vermin to hand over to the chickens. The temperature of the brooder should be regulated as carefully as an incubator; if not, trouble will follow. Too high or too low a temperature will cause bowel troubles, cramps, staggers, &c. The foster-mother should be started at a temperature of 95 degrees—after the chicks or ducklings are settled in their sleeping compartment—and should be lowered gradually as the chicks or ducklings grow. Care should be taken not to overcrowd the brooder. Especially is this the case with chickens. Ducklings will not huddle up as close as chicks; chicks, on the other hand, will huddle up into a corner if not separated with a couple of shingles or boards. If the young birds are allowed to huddle closely together in a corner of the brooder, the result will be sweaty and dead chicks in the morning.

In the early stages of brooding the chicks or ducklings, much will depend on the time of year. In the early winter months the youngsters require more warmth, and will use the brooder longer and more often than in the summer months. For the first week I like to confine the chicks or ducklings to the brooder run;. after that, they are allowed to run on the ground. Care should be taken to keep them in brooder runs till the dew and dampness have left the ground each morning, and if wet weather comes they should be kept in their brooder runs till the ground is dry again. Chicks, as they grow, require more run than growing ducklings. The latter, if allowed a large run, will race about until tired out, then rest a while, and at it again; but ducklings, when commencing to feather, take things more sedately, and do not run about so much. The length of time that chicks or ducklings should be kept in the brooder will depend on the season and weather. Generally, if the weather is favourable, chickens should be brooded from eight to ten weeks; in very warm weather, less. Ducklings should be brooded four to five weeks, and housed fairly warm afterwards. Chickens, when feathered, should be taught to roost instead of huddling together in boxes or corners. If you lift them up on to the perches for a night or two, you will find they will resort to the perch themselves as soon as night comes.

A few words on the Breeding of Birds.

To produce good chickens or ducklings we *must* have a good foundation; all the food, care, &c., will be of no avail if we do not have good, healthy, vigorous breeding stock to commence with. Eggs laid by weak parents or over-fat birds will not produce good chickens. Each bird penned for breeding purposes should never have known *one day's* illness of any kind, and should be so fed that it will not lay on fat or become "out of sorts" through improper feeding.

The mating of the birds should be done carefully. The male bird should be strong and vigorous, and should not be overmated. He should be watched occasionally to see that he is lively and in vigorous health; if he becomes listless or mopish, then the eggs from his pen will prove unsatisfactory. Another point to be watched is to see that the male bird has no favourites; if he has, it is a good plan to remove them for a day or two until he makes up to the neglected hens.

Care should be taken that the degree of relationship of the birds is not too near or too distant; if so the fertility of the egg will be diminished.

The question is often asked, "How many females should be mated with a male bird?" To answer this correctly is not easy, for much depends on the male himself; besides, each variety or breed will differ more or less. For instance, the Asiatics, or large breeds, will not take as many females as the Mediterranean, or lighter breeds. I have become a believer in mating a larger number of females than the orthodox rule, and I find I get better results, especially with the lighter breeds. Early in the season fewer hens are needed, but as the season advances the numbers may be increased. For the lighter breeds I generally mate up five or six hens, and add, as the season advances, up to nine or ten, and even *twelve* hens. With the medium breeds—Wyandottes, Orpingtons, &c.—four or five at first, and increase up to eight or ten. With the larger or heavier breeds, three or four hens early in the season, and increase up to eight. Of course, a good, lively, vigorous male bird must be at the head of affairs to get best results.

The hen should be considered as well as the male bird, and must be sound and healthy if we wish to get good fertile eggs. On her depends the greater part of the production of the future chick. She should produce a perfect egg, stored with the proper nutriment for the development of the embryo, and the foundation of health, growth, &c., for the future bird.

STRAINING BARBED WIRE.

Mr. GEO. CHAPMAN of Wollombi says: "In the May issue of the *Gazette* appeared an article on 'Straining Barbed Wire.' The plan I adopt is the following:—In the centre post of a straight line of wire fencing posts I bore two ⅝ holes, one between the two top wires and one between the two bottom wires. If the posts are high then three holes. Next I provide two pieces 3 x 2 hardwood, same lengths as post, in these I bore corresponding holes to carry ½ in. bolts, about 18 in. long, screwed for about 4in., with washers and nuts to fit. The bolts are then run through one of the 3 x 2 pieces, then through the post, then through the other 3 x 2 piece, and lastly nutted, allowing as much space between the 3 x 2 pieces and the wire post as bolts will permit. To these 3 x 2 pieces the ends of the barbed wire are secured and moderately strained from the opposite ends. The nuts are then screwed up and a good job is the result. The same method is a good one in ordinary wire straining."

Melanose in Mandarins.

MELANOSE in mandarins, to which attention was called last year, has since been observed and studied. This disease has only appeared on our mandarins of recent years, and does not appear to be very serious. However, it deteriorates a certain quantity of fruit, and should be paid attention to.

The parasite is a fungus of the species *Septoria,* which forms under the skin and on the back of the sections. It produces on one or two sections a spot, greenish at first, afterwards black, accompanied by an alteration of the pulp, which ferments. The rest of the fruit may remain sound a long time.

Should the attack appear very serious, the best treatment is spraying with Bordeaux mixture during the summer. The disease does not show itself until the fruit is mature; then it is useless to do anything; but it is advisable to apply a preventive treatment to the trees which are known to have borne fruit affected by the melanose.

Description of the Parasite (Septoria glaucescens, Seab).—When the development of the mycelium is advanced, on the skin of the mandarin is found a depressed brown spot, which is, however, not very distinctive, as the same appearance may be caused by various circumstances. If you lift the skin on the back of the section at the commencement of the disease you will find a greenish fur-like spot, which is similar to *Penicillum glaucum.* These spots are formed by a greenish mycelium, which soon changes, when in contact with the pulp, to a dense black tissue, which is charged with numerous confluent pycnides. At this time the mycelium is brown, and the pycnides are greenish and depressed, the diameter varying from 80 to 180 millimetres. The spores, which escape from the ripe pycnides, are 12 to 16 millimetres long and 2½ millimetres in thickness, some of them being grooved, others having three divisions.—*Agricultural Bulletin, Algeria.*

Standards for Grain.

JAS. STEPHENSON.

With the immediate prospect of this Colony becoming a large wheat-exporting centre, the question as to how we can best and most cheaply handle grain and place it properly before the purchasing nations becomes an urgent one.

It is evident that the methods of the past will require alteration in regard to both land and sea carriage, facilities for handling, and other important matters; but even were all these points attended to there is still another which is deserving of more attention than has been previously bestowed on it, namely, the institution of standards of quality, by which alone standards of price can be properly adjusted and compared.

In the older countries of the world the establishment of standards of value for grain has always held an important position. The origin of this custom may be traced back to the "first-fruits" offered to the Deity in the early days of Bible history. Early in Genesis we find Jacob vowing "tenths" of his flocks and herds, and we can trace through all history payments in kind to the Deity, the church, the State, overlords, and others, most, if not all, being based on current or accepted values.

Coming down to the eighth century, we find laws of Athelstane, Edgar, and Canute confirming to the church certain tenths or tithes of produce, including direct products, such as grain, &c.; secondary products, such as milk, wool, &c.; and the personal produce of handicrafts, such as building, weaving, bow-making, and other crafts.

In the reign of William IV, the Tithes Commutation Act provided for the payment of all Crown rent charges on the basis of a standard fixed by the septennial valuation of corn, and in 1837 it is curious to note the averages thus struck. We find the average prices as at 9th December in that year as follows:—

Wheat	7s. 1¼d.	per Imperial	bushel.
Barley	3s. 11½d.	do	do
Oats	2s. 9d.	do	do

Fifty years afterwards—in 1887—the prices had declined to 4s. 11d., 3s. 10d., and 2s. 7½d. respectively. Present day's rates are still lower for wheat; barley and oats being about the same.

The tithes in England and Ireland and the "fiars" or "teinds" in Scotland are struck annually by a Sheriff's Court, and the averages are based on the average quality and price of the staple grain of each district. For this purpose inspectors of corn returns are required to furnish summaries of quality and price to the Board of Trade, and as there are Corn Exchanges at most agricultural centres, a good deal of the necessary information is obtained through their agency, and based on their standards of quality and weight, which are consequently accurately and carefully ascertained from year to year.

The machinery thus provided has had such an important bearing on commerce that the establishing of "fair average quality" (FAQ) standards has come, in most grain-producing countries, almost to the level of an exact science. America, as is usual, has kept well to the front, and nearly all grain transactions there are based on the certificate of duly qualified experts. Business is done by sample and store warrant, time is saved, and the crude methods heretofore obtaining in these colonies have given place to a system whereby both buyer and seller are arguing from known premises, instead of wandering in the dark. Contrast, for a moment, our system with theirs. Here a grain merchant or miller wants to make up, say, 10,000 sacks of wheat to fill an order or a season's requirements, the wheat to be up to a certain standard of quality. He knows—or surmises from general report—that Riverina wheat is somewhat pinched, western samples good but dirty, and northern sound but soft. For his purpose we will assume that one-half of western, with one-fourth each of Riverina and northern, will make a blend such as he wants.

How to get it is then the question. He has an agent buying for him in the north, a broker submits samples from the south, and the western supply is held by farmers and millers all over the west, or has been sent to half a dozen firms at half a dozen stores in Sydney. Knowing, as he does, that while many samples may be relied on to fairly represent the bulk, there is always a proportion of them unreliable and misleading. It thus becomes necessary to sample practically every consignment, and even when this has been done there is an uncomfortable feeling that some bad spots may have been missed.

The computed quality, therefore, may or may not be attained, and further purchases and sales may be necessary to bring the staple up to requirements.

The American buyer, on the other hand, when he has made up his required sample, has only to go on 'Change and purchase a certain number of store-warrants, representing the quantity and quality he has fixed.

He can then absolutely depend on the bulk being as represented, the elevator companies having no interest beyond their tariff of store charges.

Here arises the question of grain elevators, a question which is at present agitating this Colony as well as Victoria. In order to obtain equality of samples, and at the same time provide the best facilities for cleaning, grading, and handling, a system such as has been so largely availed of in America must ultimately be adopted here, and it seems self-evident that it will be easier to begin exporting on proper lines than to adopt new methods after our opening markets have been spoilt by shipments of badly graded and badly cleaned grain.

The Government, recognising the importance of this subject, has placed on the Loan Estimates for 1899–00 the sum of £100,000 to provide for improved facilities for exporting; the erection of elevators, &c., being part of the scheme.

While this scheme is being perfected, however, it is necessary to take some precautions against failure, and here the idea of establishing standards of fair average quality may be found useful as a stop-gap until replaced by better methods.

Some three years ago I submitted a report on this subject to the Board for Exports, and while this report was being considered the grain section of the Chamber of Commerce claimed that that body, having the necessary facilities, could best undertake the work. The Minister for Agriculture assented, on the condition that Messrs. Valder and Guthrie, representing the Department, should be attached to the sub-committee. For two seasons this committee has endeavoured to get the producers to supply information and samples to enable averages for the various districts, and the Colony generally, to be struck. This effort has, however, met with but little success, and the committee has had to depend on samples drawn from such bulk lots as arrived in Sydney early in the season.

This is manifestly an imperfect means of arriving at accurate results, and as purchasers outside the Colony would be likely to place some dependence on samples declared by an important body such as this to fairly represent the season's yield, it is necessary that some more certain course should be taken in future to decide points of such importance. The grain section of the Chamber of Commerce consists mainly of merchants, millers, and grain-brokers, and, as such, may well claim to have considerable practical knowledge of the subject; but the wheat-growers must also be represented in order to establish their confidence in the standards fixed, as well as to educate them up to the importance of having a fixed basis on which to compare the staples of different districts and different seasons.

It might, therefore, be well, instead of asking the secretaries of agricultural societies to procure samples from each district, to invite each society to nominate one properly qualified producer willing to undertake this work. These gentlemen would then interest themselves in procuring fair standard samples, which would be forwarded to Sydney as collected.

They would also nominate from among their number a sub-committee of, say, ten members, to meet an equal number of millers, merchants, &c., nominated by the Chamber of Commerce and the Department of Agriculture.

The decision of a body so constituted would command the respect of all, and standards fixed by them would be at once accepted in Britain, which would naturally be our leading market.

One difficulty arises in the fixing of standards, namely, the difference of wheat grown in the west, north, and south, and it would probably be found well to make standards for each. Manitoba and Duluth wheats would, of course, be classed by themselves. This is important, as a good demand is likely to arise for these hard wheats, which are well adapted for our colder and wetter districts.

In fixing a season's standards the committee would naturally reject all samples of a "fancy" nature, and also such as were evidently of too low a character, blending only the samples most nearly approaching the average, and keeping in view the proportionate bulk represented by each sample.

The standard of weight would be fixed by properly measuring, with the appliances provided by the Department of Agriculture, a series of bushels from each set of samples, after the whole had been carefully mixed. The grain actually used in fixing the F.A.Q. standards would then be put up in sealed bottles or other properly contrived packages, and be made available for public information by being placed in the hands of secretaries of agricultural societies or members of the selection committee.

Private individuals might be supplied with samples on payment of a small fee, and the leading corn exchanges in Britain might also be furnished with them. In supplying samples to the latter, information might be given as to available stocks, names of leading holders, &c., and also of the fact that the Board for Exports' certificate of quality could be obtained before shipment.

By such means it is expected that New South Wales wheat might be placed on British markets under the most favourable auspices; and when a proper system of bulking and grading has been initiated under the proposed elevator scheme, there is every reason to expect that our wheat will take as high a place for quality as our wool does at present.

COW-PEAS.

THE Rev. E. Hargraves, writing to Mr. Valder from the Rectory, Penrith, says:—I have had, this season, rather less than a quarter of an acre of cow-peas, from seed purchased from the H. A. College. I commenced cutting it for cow-feed about Christmas Day, and have had a second growth from most of it, which I am still using (23rd May, 1900). My cows are an aged one (11 years) and a heifer only milking about six months. They have been fed almost entirely upon the pea morning and evening, a couple of quarts of mixed bran and pollard being added, one for each beast. We have had abundant milk and butter from them, and are now getting more than two large bucketsful a day, and from 8 to 10 lb. of butter a week. Besides this, my three horses have had a good share of the peas, and are now getting nothing else but them and the usual grass run. The second crop gave the largest return of seed. I reckon there is another fortnight's feed on the patch. It was grown on cold yellow clay, which had been twice ploughed and harrowed; limed and manured at the rate of one bag (2 cwt.) bonedust to the whole paddock. I had pumpkins, &c., on remainder of paddock.

Fumigation Table.

In the article which appeared some months ago on the subject of fumigation for insect pests, the table of quantities printed was that prepared by the Californian Government Entomologist. After many careful experiments the Fruit Expert, Mr. W. J. Allen, has come to the conclusion that for our different climatic conditions the quantities given by Mr. Woodworth require to be considerably altered before New South Wales growers can expect to derive the best results from fumigation. Mr. Allen has accordingly drawn up the following table of quantities of cyanide, sulphuric acid, and water to be used for trees of various sizes, and based on numerous successful tests conducted in many different citrus orchards in the county of Cumberland and other orange-growing districts :—

Diameter.	Height.	Capacity.	Cyanide.	S. Acid.	Water.	Diameter.	Height.	Capacity.	Cyanide.	S. Acid.	Water.
			oz.	oz.	oz.				oz.	oz.	oz.
4	4	43	⅓	⅓	1¼	17	13	2,536	12½	12½	37
4	5	54	⅓	⅓	1¼	17	14	2,731	13½	13½	40
4	6	65	⅓	⅓	1¼	17	15	2,926	14½	14½	43
5	5	85	½	½	1½	17	16	3,122	15½	15½	46
5	6	101	½	½	1½	17	17	3,317	16½	16½	49
5	7	118	½	½	1½	17	18	3,512	17½	17½	52
6	6	146	¾	¾	2	17	19	3,707	18½	18½	55
6	7	170	1	1	2½	17	20	3,901	19½	19½	58
6	8	195	1	1	2½	17	21	4,096	20¼	20¼	60
7	7	232	1¼	1¼	3	17	22	4,291	21¼	21¼	63
7	8	265	1¼	1¼	3	18	12	2,625	13	13	39
7	9	298	1½	1½	4	18	13	2,843	14	14	42
8	8	346	1¾	1¾	5	18	14	3,062	15¼	15¼	45
8	9	389	1¾	1¾	5	18	15	3,281	16¼	16¼	48
8	10	432	2⅛	2⅛	6	18	16	3,500	17½	17½	52
9	8	437	2⅛	2⅛	6	18	17	3,718	18½	18½	55
9	9	492	2⅓	2⅓	7	18.	18	3,937	19½	19½	58
9	10	547	2¾	2¾	9	18	19	4,156	20½	20½	61
9	11	601	3	3	9	18	20	4,374	21¾	21¾	65
10	8	540	2¾	2¾	9	18	21	4,593	22¾	22¾	68
10	9	608	3	3	9	18	22	4,812	24	24	72
10	10	675	3⅓	3⅓	9	18	23	5,030	25	25	75
10	11	743	3¾	3¾	10	18	24	5,249	26	26	78
10	12	810	4	4	12	19	13	3,168	15½	15½	46
11	8	653	3¼	3¼	9	19	14	3,412	17	17	51
11	9	735	3¾	3¾	10	19	15	3,656	18	18	54
11	10	817	4	4	12	19	16	3,899	19¼	19¼	57
11	11	898	4½	4½	13	19	17	4,143	20½	20½	60
11	12	980	4¾	4¾	14	19	18	4,387	21½	21½	64
11	13	1,062	5¼	5¼	15	19	19	4,630	23	23	69
11	14	1,144	5¾	5¾	17	19	20	4,874	24	24	72

FUMIGATION TABLE—*continued.*

Diameter.	Height.	Capacity.	Cyanide.	S. Acid.	Water.	Diameter.	Height.	Capacity.	Cyanide.	S. Acid.	Water.
			oz.	oz.	oz.				oz.	oz.	oz.
12	8	778	3¾	3¾	10	19	21	5,118	25	25	75
12	9	875	4⅓	4⅓	13	19	22	5,362	26½	26½	78
12	10	972	4¾	4¾	14	19	23	5,605	28	28	84
12	11	1,069	5¼	5¼	15	19	24	5,849	29	29	87
12	12	1,168	5¾	5¾	17	20	13	3,512	17½	17½	52
12	13	1,264	6	6	18	20	14	3,782	18½	18½	55
12	14	1,361	6¾	6¾	19	20	15	4,053	20	20	60
12	15	1,458	7¼	7¼	21	20	16	4,323	21½	21½	63
13	8	947	4½	4½	13	20	17	4,593	22¼	22¾	67
13	9	1,026	5	5	15	20	18	4,863	24	24	72
13	10	1,141	5¾	5¾	17	20	19	5,133	25½	25½	75
13	11	1,255	6¼	6¼	18	20	20	5,404	27	27	81
13	12	1,369	6¾	6¾	19	20	21	5,674	28	28	84
13	13	1,481	7⅓	7⅓	21	20	22	5,944	29½	29½	88
13	14	1,597	8	8	24	20	23	6,214	31	31	93
13	15	1,711	8½	8½	24	20	24	6,484	32	32	96
14	8	1,058	5¼	5¼	15	21	14	4,168	20½	20½	60
14	9	1,191	6	6	18	21	15	4,466	22	22	66
14	10	1,323	6½	6½	19	21	16	4,763	23½	23½	69
14	11	1,455	7¼	7¼	21	21	17	5,061	25	25	75
14	12	1,587	7¾	7¾	22	21	18	5,359	26½	26½	78
14	13	1,720	8½	8½	24	21	19	5,657	28	28	84
14	14	1,852	9¼	9¼	27	21	20	5,954	29½	29½	88
14	15	1,984	9¾	9¾	28	21	21	6,252	31	31	93
14	16	2,116	10½	10½	30	21	22	6,550	32½	32½	97
15	8	1,215	6	6	18	21	23	6,847	34	34	102
15	9	1,367	6¾	6¾	19	21	24	7,145	35½	35½	106
15	10	1,519	7½	7½	22	21	25	7,443	37	37	111
15	11	1,671	8¼	8¼	24	22	15	4,901	24½	24½	73
15	12	1,823	9	9	27	22	16	5,228	26	26	78
15	13	1,975	9¾	9¾	27	22	17	5,555	27½	27½	82
15	14	2,127	10½	10½	31	22	18	5,881	29	29	87
15	15	2,279	11¼	11¼	33	22	19	6,208	31	31	93
15	16	2,430	12	12	36	22	20	6,535	32½	32½	97
15	17	2,582	12¾	12¾	37	22	21	6,861	34	34	102
15	18	2,734	13½	13½	40	22	22	7,188	35½	35½	106
15	19	2,886	14¼	14¼	42	22	23	7,515	37½	37½	112
15	20	3,038	15	15	45	22	24	7,842	39	39	117
16	10	1,728	8½	8½	24	22	25	8,168	40½	40½	121
16	11	1,901	9½	9½	28	22	26	8,495	42	42	126
16	12	2,074	10¼	10¼	30	23	15	5,357	26½	26½	79
16	13	2,247	11	11	33	23	16	5,714	28½	28½	85
16	14	2,420	12	12	36	23	17	6,071	30	30	90
16	15	2,492	12½	12½	37	23	18	6,428	32	32	96
16	16	2,765	13¾	13¾	40	23	19	6,785	33¾	33¾	100
16	17	2,938	14½	14½	43	23	20	7,142	35½	35½	106
16	18	3,111	15½	15½	46	23	21	7,500	37½	37½	112
16	19	3,284	16¼	16¼	48	23	22	7,857	39	39	117
16	20	3,456	17¼	17¼	51	23	23	8,214	41	41	123
16	21	3,629	18	18	54	23	24	8,571	42½	42½	127
16	22	3,802	19	19	57	23	25	8,928	44½	44½	133
17	12	2,341	11½	11½	34	23	26	9,285	46	46	138

Manitoba Wheats.

W. FARRER.

I WILL begin by drawing attention to the title of this short paper—that it is on Manitoba Wheats and not Manitoba Wheat.

During the last month or two, the Press has had a good deal to say about the failure of Manitoba wheat to produce strong-flour yielding grain in this Colony. Strong-flour wheats have only of late years emerged from total neglect and come to be appreciated in this Country. Some ten or twelve years ago I found it a waste of time to draw attention to the value of these small-berried, flinty, and, as compared with our own soft varieties, mean looking and unattractive wheats. However, when the failure of own crops a few years ago caused it to be necessary to import grain for our own consumption, certain of the more intelligent of our Sydney millers saw their chance and succeeded in having these wheats given a trial, with the result that their intrinsic merits have now secured for them a firm place in public estimation.

The so-called Manitoba wheat which millers have been introducing and encouraging farmers to grow, does not by any means consist of a single variety. I have seen a few growing crops, which were grown for seed, which had been introduced in this manner, and in each case have found that these importations have not consisted of a single variety, but of a mixture of several. My examination also of these crops has led me to form the opinion that they were by no means made up exclusively of strong-flour varieties. It is reasonable to suppose that of the many importations we have received, in addition to mixtures into which strong and weak flour varieties have entered in different proportions, some may have been of strong-flour varieties alone and others, possibly, even of weak-flour sorts exclusively. This alone would account for the inferiority of the flour, the Press has been telling us, some of the Manitoba wheat crops have produced; as well as for the high strength of the flour that some of these wheats have yielded in the laboratory of the Department.

If I am not mistaken, the farmers of Manitoba have not always grown the strong-flour varieties for which that place is now so famed. They appear during the last twelve or fifteen years to have been improving their wheats in the same direction as we are ourselves beginning to seek to improve ours. They have been getting more and more into strong-flour sorts apparently by means of introductions from Minnesota. This I am led to think is the case by the facts that (1) the variety I received from America 13 or 14 years ago as "Manitoba" is a weak-flour wheat, and (2) that I have found some of the best Minnesota (or Duluth) varieties in the mixed crops

I have seen growing from recent importations from Manitoba. These good, strong-flour varieties, however, as we are finding to our cost, do not by any means appear to have yet got sole possession of the field in Manitoba. It is, in fact, probably undesirable from the home point of view in Manitoba that they should; for the strong-flour sorts, most of them at any rate, produce flour of too dark a yellow colour, and make more attractive bread when they are mixed with weak-flour sorts, the flour of which is whiter; and it is likely to be better for the people of Manitoba to grow some of these weak-flour sorts for themselves, than to have to import them. That some of the weak-flour Manitoba sorts are suitable for this purpose, is shown by the fact I have already alluded to, that grain of last year's growth, of a variety (most likely one of the standard varieties that grew in those days) which I received from America some thirteen or fourteen years ago under the name of "Manitoba," yielded a flour of much the same character (indeed, a shade weaker) and appearance as did last year's purple straw. The grain, by the way, of this weak-flour Manitoba wheat is red, and differs in appearance very little, if at all, from that of the best strong-flour sorts.

This Department is already taking measures to select and separate from some of the Manitoba wheats which have been imported the strong-flour varieties they contain, which alone we want. This is being done for the purpose of raising pure seed of them in quantity; and with this object in view, a collection of several of these wheats has been made and is being planted this season at Lambrigg. The Department, however, is already in possession of pure seed in small quantity of several strong-flour varieties; and two of the best of them, viz., Powers' Fife and Minnesota Blue Stem, which are being propagated at the Bathurst Farm, will be available—a few bushels of each, at any rate—for sale or distribution after next harvest, and some of the others a year afterwards.

The failure, however, of some of the introduced Manitoba wheats to produce strong flour is doubtless not due entirely to their not being strong-flour varieties, or made up mainly of such, but to other causes. No grain can yield strong flour unless it is at least fairly rich in the nitrogenous constituent—gluten; and it cannot be rich in this ingredient unless the soil it is grown in can furnish it with nitrogenous plant-food in sufficient quantity; and more than that, we have reason for thinking, sufficient nitrogenous plant-food of the right kind. That Manitoba, or any strong-flour wheats, should be expected to produce strong-flour grain when they are grown in thin or worn-out soils is unreasonable. The soils from which the best strong-flour grain is harvested in America are deep and rich in plant-food amongst which vegetable matter (humus) is well represented; and as it has been found that the cropping of such soils reduces their content of humus, and with it the quantity of nitrogen they contain, for the holding of which humus acts the part of an indispensable storehouse, it could hardly be otherwise than that a progressive decrease in the gluten-content, and therefore in the flour strength of the grain it produces, should follow the cropping of new land; and this, I believe, is what is actually recognised to be taking place in the State of Minnesota. One, indeed, of the most important and attractive problems that we have before us in agriculture is that of discovering (and it can only be done by means of experiments) a practical method of managing the soil when it is under cultivation, so as not only, on the one hand, in the case of rich soils, to prevent a progressive decrease of their content of humus, but on the other, in the case of thin soils, even to increase the humus in them to the extent of enabling them to grow crops of strong-flour grain. This is a problem which, I believe, is not incapable of solution, and ought to be attacked.

IMPORTED FOWLS AND GEESE, PER S.S. "WARRIGAL," FOR POULTRY FARM, HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

ALL the birds arrived in splendid condition (two of the pens, B. and W. Leghorns laying day after arrival), and are of aristocratic parentage, as the following shows:—

Trio *Black Orpingtons.*—Cockerel, 1st Norwich Show, 1899; pullets unrelated, both from prize birds.

Trio *White Leghorns.*—From Messrs. Abbott's stock which have won many prizes in England and other countries.

Trio *Brown Leghorns.*—Cockerel from parents which won 1st prize and silver cup at Birmingham; pullets are out of 1st prize Crystal Palace birds—Mossop's successful stock.

Trio *Silver-grey Dorkings* (from the Hon. Florence Amherst).—Cockerel, son of 1st prize and Special Dairy Show, 1898, 1st and special Crystal Palace, and 1st Birmingham; pullets are from hens bought in Scotland—winners of 1st prizes.

NOTE.—The cock (of which this cockerel is the son) was, in Miss Amherst's absence abroad, entered at the Dairy Show in mistake at selling price (£5), where it was claimed by Captain Hornby; and Miss Amherst claimed him back, at the Crystal Palace Show the following month, for £50.

Trio *Emden Geese.*—Gander 2nd at Manchester Show; geese from 1st prize winners, and unrelated.

Trio *Toulouse Geese.*—Geese from same pen as birds which won at last two Smithfield Table Poultry Shows; by Abbott Bros'. gander, from Bygott's prize birds. (Above particulars by Messrs. John Thornton & Co.).

The Poultry Expert at H. A. College says that the above shipment is one of the best and most even quality of birds he has seen landed. The geese are the largest that have been landed in the colonies, and the collection of fowls more than good.

A limited number of eggs from these imported birds will be on offer about July; prices on application to Principal H. A. College or Poultry Expert.

Preliminary Report on the effect of Sulphur Fumes on Flour.

F. B. GUTHRIE.

At the request of Messrs. Gillespie Brothers, I have examined the effect of exposing flour to the fumes of burning sulphur. For this purpose a sample of Messrs. Gillespie Bros.' ordinary flour was exposed to the fumes of burning sulphur in the following manner :—

A few ounces of sulphur were burnt in an airtight wooden box with a lid which fitted closely, and was weighted down to make it nearly airtight. The flour was suspended in a calico bag from the under side of the lid. The whole was left to itself for six hours. The flour was then emptied out and left in the open air, with frequent stirring, in order to allow the sulphurous acid to escape. The original flour gave the following figures on examination :—

Strength	48·6
Colour	excellent.
Gluten	10·00

The flour that had been exposed to the fumes of sulphur was apparently unaltered in appearance. On attempting to wash out the gluten from the dough in order to determine the gluten content, a slimy, sticky mass was obtained, which washed away between the fingers without leaving a trace of gluten. On attempting to determine the strength it was only possible to make a dough containing 36 quarts of water per sack, at which point it became quite sticky and unworkable, though unlike dough made under similar conditions from ordinary flour in being quite hard and heavy.

The colour of the sulphured flour, though somewhat lighter than the original, was still fairly good, though the surface texture of the flour was inferior.

The baking test was a complete failure. It is impossible to prepare a proper sponge, the dough becoming very sticky and impossible to handle. It was not possible to obtain a light dough. The fermentation in the sponge was very slight, and on baking the loaves hardly rose at all, and produced a heavy sodden crumb without texture.

It would appear that the action of sulphur fumes on flour is to affect the composition of the gluten. Gluten (moist) exposed similarly to sulphur-vapour becomes sticky, forming a soft gummy mass which dissolves in water and alcohol to a milky solution. Ordinary gluten is insoluble in water and partly soluble in alcohol, one constituent (glutenin) being insoluble in alcohol, and the second constituent (gliadin) being soluble in alcohol.

It would appear that the action of the fumes of sulphur is to attack one of the constituents of gluten, namely, the glutenin, and to alter its characteristics.

In order to test this, a sample of pure glutenin was exposed in the moist state under a bell-jar to the fumes of burning sulphur.

It very soon lost its coherent nature, became very soft and sticky, and dissolved to a milky solution in water and alcohol, the original glutenin being quite insoluble in either of these liquids.

What the actual change is that is brought about by the fumigation is a matter for further research, and I hope to be able to investigate the matter more fully at an early date.

In the meanwhile a word of warning should be given to millers and shippers of wheat, directing their attention to the fact that flour is very seriously affected by sulphur fumes, and warning them from storing or shipping them in bins or bags or other receptacles which have been recently fumigated with sulphur.

Experiments will be conducted to ascertain whether grain is affected in the same way. In the meanwhile it is safer to assume that it will be so affected, and to avoid storing either grain or flour in receptacles recently fumigated with sulphur.

AGRICULTURAL LIME.

THE lime and agricultural lime, hitherto sold by the Cullen Bullen Lime and Cement Co., can now be obtained from the Sydney and North Sydney Lime and Cement Co., 279, George-street, Sydney. This firm guarantee that their "agricultural lime" is unslacked lime, and is, consequently, just as suitable for liming the soil as is the more expensive building lime.

On sour soils, or soils deficient in lime, it should be applied in a freshly slacked condition, at the rate of about 1 ton to the acre. A full discussion of the action of lime on the soil, and the method of its application, will be found in the *Farmers' and Fruit-growers' Guide*, pages 44, &c.

Bee Calendar.

JULY.

BEE management differs very little during winter months. The latter part of May, June, and July, and the early part of August are the months bee-keepers can take their holidays to visit their friends—that is, if they have nothing in the shape of appliances to construct, and all repairs are completed, and winter protection perfected, as well as this wet season will admit. Bees, if properly put up for winter months, should not be opened till the days begin to lengthen and the warmth increase, then they may look in and note if there be any empty combs to remove; be sure to remove all mildewed ones. If there is not food enough to carry them on till spring, supply sufficient to do so. It will conduce to early swarming. Occasionally, look into the hives to see if there be any dampness; select a fine, warm day to do so. If such there be, find its cause, and cure it, especially if it be a leak in the roof. Dampness engenders all sorts of troubles among bees. In the coldest parts of the Colony, between the quilt and the lid of the hive, put a layer of old newspapers. It will greatly add to the warmth of the bees.

BIG CORE IN MAIZE COBS.

MR. KNOTZOCH, of Irvington, writes: "I have often noticed in judging maize in the cob at Agricultural Shows that the judges condemn maize with a big core, and it appears to me, not being a farmer, that the bigger the core the more grain is required to cover it, but am met by the remark that the small cob has a deeper grain.

"Now I can see no reason why deep grain cannot be grown on a large core, if the grower will exercise more care in the selection of his seed, for all the improvements in our culinary vegetables and grains have been principally brought about by selection of seed.

"I refer all growers to Mons. de Vilmorin's valuable paper on the Selection of Seeds and its effects on cultivated plants, which article every farmer should study (April number). I should like to hear the opinions of practical maize-growers in the different districts of New South Wales."

Farm Notes.

NORTHERN RIVERS DISTRICT.—JULY.

H. V. JACKSON.

LAND should be prepared for early spring sowing—oats, barley, field, peas, teosinte, millet may be sown for green fodder; rape may also be sown.

Potatoes should be planted in well-drained ground. The varieties that have given most satisfaction here are Australian Monarch, Beauty of Hebron, Goulburn Red Skins, Brownell's Beauty, and Early Rose.

Deep working of the soil is necessary when preparing land for potatoes. Many trials have been made by all sorts of experimenters in the matter of seed-sowing, some favouring one system, some another; a great deal depends, however, upon the seed, the soil, and climatic conditions prevailing during the period the plants are forming tubers. Good crops are raised from small potatoes sown as whole seed, yet good-sized marketable potatoes cut into quarters lengthwise is a favourite mode, and gives satisfactory results.

It is most important to make sure that the seed potatoes are healthy, *i.e.*, free from scab and gall worm; therefore it is always advisable to purchase seed potatoes from localities you know to have produced good clean potatoes, or otherwise from careful seed-merchants. The gall worm may be introduced into a plot of land per medium of unsound potatoes, with the result that any root crops, such as mangels, beets, carrots, turnips, &c., grown in the same ground at a later period will be found infected. This undesirable potato disease is easily recognisable in the "warty" appearance of the outside of the potato. Another potato disease to be guarded against is "scab," which is easily recognisable by the scabby appearance of the outside of the potato. I have seen apparently clean seed potatoes prove a failure through this disease. They had been planted in well-worked garden soil, manured with old rotted manure from the stable and pig-pen, mixed with ashes and other refuse.

Dr. Cobb devoted some attention to these matters, and he recommended that, if land subject to scab is to be again planted with potatoes, or if scabby potatoes must be used for seed, then soak the seed for one and a half hours in a solution of corrosive sublimate made by dissolving 10 oz. of corrosive sublimate in 60 gallons of water. He also says corrosive sublimate "is a violent poison if taken internally, and should be handled and stored with care. It must not be placed in contact with metals, as it corrodes them rapidly and at the same time loses its own properties. The solution used for soaking the potatoes must be placed in a wooden vessel having no internal metal parts. There is no danger in putting the hands into the solution, but it would be well to rinse them afterwards in pure water. The solution does not injure cut potatoes, and if the potatoes are to be cut for seed they should be cut before being soaked, as the cutting of the soaked potatoes would be ruinous to knives. Plant the potatoes without rinsing them, but allow them to drain. . . . . Several bushels of potatoes may be treated for a few pence, and the treatment is very effective. Sowing flowers of sulphur at the rate of 1 to 3 cwt. per acre along with the seed potatoes appears to have been attended with a very marked diminution of scab, and the good effects of one such treatment are said to continue more than one season. . . . In case you are troubled with scab avoid, for potatoes, barnyard manure and such fertilisers as contain much lime. Wood ashes are not desirable where scab is prevalent, and potash should be supplied in some other form. . . . ."

Boil the scabby potatoes and feed the pigs; also boil or burn the parings of scabby potatoes.

Onions may still be sown. Brown Spanish Hunter River grown seed appears to give the best results; also the Red Tripoli.

In certain seasons in this locality the onion crop may suffer from onion mildew (*Peronospora schleideni*, Ung.) In a work on Plant Diseases caused by Cryptogamic Parasites, by George Massee, F.L.S., Principal Assistant, Royal Herbarium, Kew, the following information is obtained:—"The first symptom of its presence is a small yellowish patch on one or more of the leaves. These discoloured patches are soon covered with a delicate white bloom, looking like hoar-frost, which quickly changes to a greyish-lilac colour. In the meantime, the dressed patches extend until the entire leaf is usually affected, which ultimately dries up and falls back. A long neck or stalk between the bulb and the base of the leaves is almost constant in diseased plants. The bulb is not attacked; but if, as is usually the case, the disease appears early, the bulb remains very small. If a small fragment of the delicate mildew from the surface of the leaf is examined under the microscope it will be seen to resemble a miniature forest; numerous branches of the fungus spring from the mycelium present in the tissues of the leaf, and push into the open air through the stomata or pores of the leaf for the purpose of producing spores. Each branch of the fungus, when it has passed outside the leaf, divides into numerous branchlets, each of which bears a spore, or reproductive body, at its tip. The minute spores, which are produced in immense numbers, are carried by wind or rain on to the surface of neighbouring healthy leaves, where they germinate at once, enter the tissues of the leaf, and give origin to a mycelium that soon produces fruiting branches, which grow through the stomata of the leaf and form their spores in the air, which serve in turn for the infection of other plants. A second mode of reproduction is possessed by the fungus. Numerous globose, thick-walled bodies, called resting-spores, are produced on the mycelium present in the tissues of the decaying leaves. These resting-spores do not germinate until the spring following their production, when they inoculate the young onions and start the disease afresh. During the winter the leaves containing these resting-spores completely decay, but the spores remain unchanged in the soil until the return of spring.

"*Preventive Means.*—In the early stage of the disease its spread may be checked by dusting with powdered quicklime and sulphur, using twice as much lime as sulphur. This is best applied with bellows, and when the plants are damp. Spraying with sulphide of potassium—half an ounce to a gallon of water—will also answer the purpose.

"Prevention rather than cure, however, should be the constant aim, and this can be assured if the known means for securing it are systematically and thoroughly carried out. It has already been stated that the first appearance of the disease in the spring depends on the presence of resting-spores of the fungus, which are produced in the leaves previously killed by the summer form of the fungus. Therefore, relative immunity from disease depends on the amount of care exercised in collecting and burning all such diseased leaves. If allowed to lie on the ground and rot, the resting-spores are set free in the soil; and as they retain their vitality for at least two years, there is a constant and practically a certain danger of the disease breaking out afresh. This may appear a tedious, and some will say impracticable, method of preventing the disease; nevertheless it is certain. If practicable, onions should not be grown on the same land more than once in three years, as at the expiration of this period all resting-spores present in the soil are dead. Damp and shaded situations favour the spread of the summer, or mildew, form of the disease."

Plough and subsoil land for spring sowing of lucerne.

In warm situations tomatoes may be planted out, provided they are protected every night from the possibility of frost. Make sowings of broad beans, silver beet, cabbage, cauliflower, endive, lettuce, parsnip, radish, &c.

In the orchard planting may be gone on with; the pruning of the fruit-trees should also be commenced. Save the sound prunings for pea sticks.

RIVERINA DISTRICT—July.

G. M. McKEOWN.

Wheat.

Although July is in ordinary seasons too late for sowing wheat, the recent rainfall has been sufficient to render sowing with good chances of success possible if seed be got in without delay.

Wet days have been so frequent as to cause much delay in ploughing and sowing.

Early varieties should be selected, such as Steinwedel and Hudson's Purple Straw.

Lucerne

Should be sown during July and August, as at this season the crop has a better chance of outgrowing weeds than is possible with earlier sown crops.

Alluvial flats should be selected, and, where possible, the land subsoiled. The soil should be brought to a fine tilth. A seeding of 8 to 10 lb. should be used for hay, while for pasture only as low as 3 lb. per acre has proved successful.

Drill-sowing will require less seed, and after cultivation will be made easier by this method of sowing.

Sheep's Burnet.

In portions of the district good results have been obtained from burnet. It has resisted drought and has proved most valuable for fattening sheep in all seasons.

The land should be brought into a fine condition, and seed should be sown by means of a drill if available.

Sow 8 to 10 lb. seed if sown broadcast; if drilled, 6 lb. per acre will be sufficient.

Barley

May still be sown for green fodder, the skinless variety being the best for late sowing.

Vegetables.

Prepare land for planting potatoes in August.

Plant out artichokes. The white variety recently introduced has yielded well on the farm and has proved superior in flavour to the Jerusalem. Transplant cabbage and cauliflower; sow cabbage, cauliflower, onions, and peas.

Sow under cover for early transplantation tomatoes and cucumbers.

HAWKESBURY DISTRICT.—JULY.

By GEORGE VALDER.

THE heavy and continuous rains experienced during last month has done much to retard farm operations, and farmers will have to take every opportunity to get their land ready for spring sowing.

Cereal Crops.

A great many of the crops of wheat, barley, and oats have made a very strong growth, and reports are coming to hand of some few of them being already in ear. Such crops should be either fed down with stock or cut for green fodder. Last year a paddock of our wheat came into ear in July; we then cut it for green fodder, and afterwards broadcasted superphosphate on it at the rate of 1 cwt. per acre, and harrowed it in, with the result that we obtained a good second crop for hay. Rye has also been treated in the same way with very satisfactory results, but it is best to cut it at an earlier stage.

Rape and Mustard.

Small sowings should still be made. The season, so far, has been very favourable for these crops. Very heavy yields have been obtained, and rape has proved especially valuable for feeding to pigs and sheep. Last season mustard made a much more rapid growth than rape and gave a heavier crop, but this year the result is in favour of rape.

Onions

can still be sown. Every precaution should be taken to obtain the best seed, as very much depends upon this. Seedlings from the early sown beds should be transplanted out during the showery weather. Choose, if possible, well-sheltered situations for this crop. When exposed to winds, plant breaks of strong-growing varieties of cereals at frequent intervals.

Tobacco.

Seed-beds should be prepared, and early sowings made. The young plants are very sensitive, and will not stand frost; the beds should, therefore, be covered with frames of brush, hessian, or glass. Make the seed-bed in a position where it can be easily drained. Procure a quantity of good soil, as free as possible of weed seeds, and mix it with well-rotted farm-yard manure. Long narrow beds—say, about 3 to 4 feet wide—are the best. When the bed is formed, pile a quantity of brushwood on it and set fire to it, taking care to burn when the soil is fairly dry on top. This will destroy many of the weed seeds, and the fine ashes will act as a manure. Rake off all the lumps of charcoal, and bring the top soil to as fine a tilth as possible. Place boards along the sides for the frames to rest upon, allowing a good fall from back to front. The seed being very fine, it is difficult to sow it evenly. The best plan is to mix it with wood-ashes, and sow broadcast over the beds, sowing first in one direction and then crossing; then press the soil lightly with a board to cover the seed, and place fine brushwood or litter over the soil to keep it from washing. Frequent waterings will be necessary.

Lucerne.

The land should be ploughed as soon as possible, and got ready for spring sowings. On the lighter loams, ordinary ploughing is often all that is required; but on the heavier soils deep ploughing or subsoiling is necessary. Once the plants become established the character of the subsoil is of greater importance than that of the surface soil. Lucerne requires peculiar conditions of soil and climate. Being such a valuable crop it is worthy of trial in districts even considered unsuitable for it, as, although it may have failed in most of the soils of a district, there might be a soil there suitable for it on which it has not been tried.

Field Peas.

Field peas for feeding to pigs, &c., can still be sown. Golden tares are also good for this purpose.

Tomato Seed

Should be sown this month, in order to obtain early plants, but, of course, the beds will need some protection. Frames should also be got ready for starting sweet potatoes.

Dairy Cattle Notes.

M. A. O'CALLAGHAN.

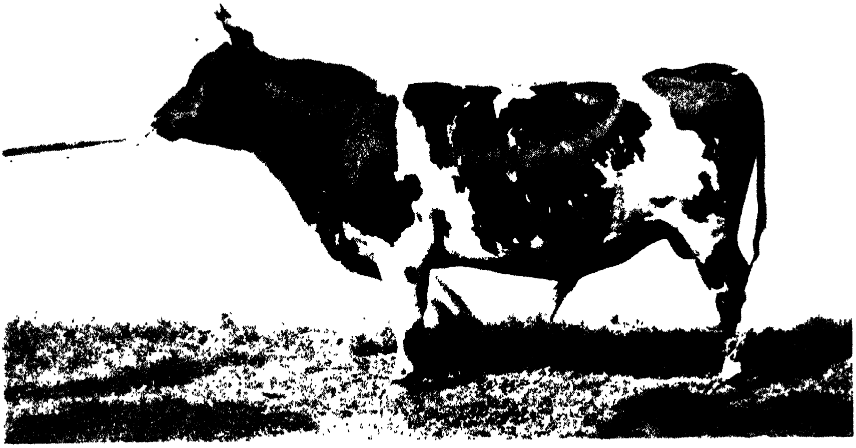
Ayrshires.

THIS extremely useful breed of cattle, so popular in Scotland, finds very little favour in England or Ireland, on account of its steers not being of much value to graziers, and on account of the cows being of too "hard" a quality. The Englishman likes something with the softness of the Durham about its characteristics. A few Ayrshires have this useful point, the greater number have not, and yet when an animal of this soft, milky type is brought before our judges in show yards, he is usually passed over. Such was the experience of the Ayrshire bull "Perfection," which is seen on opposite page, and which at last Sydney Show was unplaced in the class for bulls over 2 and under 3 years. When shown in Melbourne, six months previous, where I saw him judged, he was placed first in a very big class, and this notwithstanding the fact that the Ayrshire breed is more strongly represented in Victoria than here. What I wish to point out is that it is unwise, from a dairyman's point of view, to pass over a soft, "milky" looking animal, and place animals which perhaps may be more true to the hard, fleshless type of animal we have been accustomed to see. Custom, or what our eye has been trained to, is a wonderful factor in judging. Let anyone compare the best Ayrshires, as seen in Scotland, or the animals imported from there, with the Ayrshires as a class here, and he cannot but notice that our animals are smaller, appear less vigorous, and are not so strong in frame. I also reproduce a photo. of an Ayrshire cow I saw recently in Palmerston, New Zealand, which shows this vigorous, strong-framed, milky-looking type, which I dare say would be considered by some judges as just too good in shape to be a pure Ayrshire. The bull "Perfection" has a long pedigree, is strong and vigorous, with great depth and well-sprung rib, very good behind, and with those qualities which mark a beast as "a good doer"; and because of these, those who only know the hard, wiry type may not think him pure. In judging dairy breeds, more attention should be given to milking qualities.

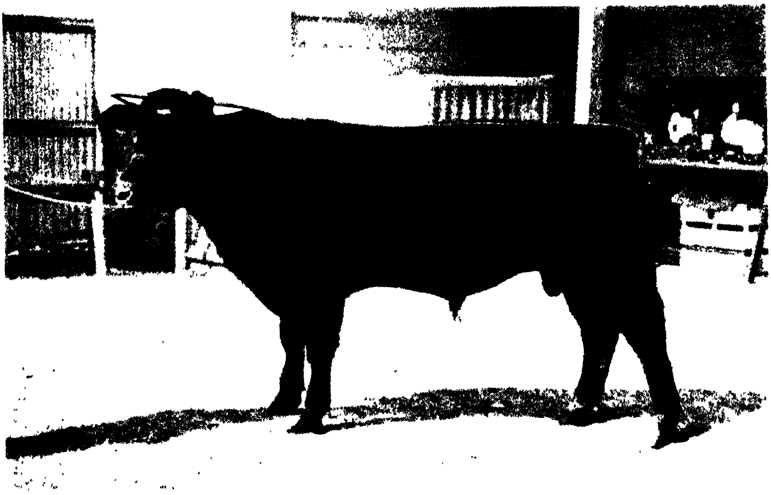
The young shorthorn bull "Oxford's Forest King," shown on same page as the Ayrshire bull "Perfection," comes of good blood. He is by "Treforrest," an animal with the following prize record :—

PRIZES won by "Treforrest," Sire of "Oxford's Forest King."

1895.	Royal Cornwall, Wadebridge	First Prize.
1895.	Launceston Agricultural Society	"
1895.	Chacewater Show, Silver cup for the best, open to the County.	
1896.	Somerset County, Wells	"



Mr Antill's Ayrshire Bull, "Perfection."
A type of "milky" Ayrshire.



Yearling Shorthorn Bull, "Oxford's Forest King."

Ayrshire Cow (Palmerston, New Zealand).

1896.	Devon County, Plymouth	First Prize.
1896.	Royal Cornwall, St. Ives	,,
1896.	Kirrier, Helston	,,
	And Special for best bull of 2 years and above in the yard.	
1986.	Chacewater Show for best bull, any breed, open to the County	,,
1897.	Penwith, Penzance	,,
1897.	Royal Cornwall, Lostwithiel	,,
	And Champion bull of the yard.	

"Alexandria 14th" (imp.), the dam of this young bull, is also a noted prize-winner. "Oxford's Forest King" was sired in England, and is now being kept at the Berry Stud Farm, to mate with some of the imported cows.

BROOM CORN.

THE extraordinary increase in the price of broom corn that has prevailed during the past two years has caused a good many farmers to devote some attention to this crop. In America it is feared that the high prices will not last, and that with the return of favourable seasons in the chief centres of American production the returns will fall to their old level or even lower. It is pointed out that the world's consumption of brush, according to the best authorities (*Rural Californian* among others), is about 30,000 tons, and there can be no great increase because the material is used for the sole purpose of broom and brush making. Practically the whole of this 30,000 tons is grown on about 112,000 acres, about 28,000 tons being produced in Illinois; and it is said that the men engaged could easily on the land there available double this output if warranted by the demand.

In the United States the crop is a precarious one that may be ruined by a few days' weather, and to produce a ton of broomcorn under fair conditions requires about 3 acres of land. The cost of production, under the best of conditions, is said in America to be at least £10 per ton, and the prices range from £15 to in some years of glutted markets £6.

From experiments conducted at the departmental farms, and according to the experience of most of the principal broom corn growers in the Hunter River district, the returns obtained in New South Wales are a good deal higher. Certainly it will not require a very large area to produce all the broom stuff there is a demand for in New South Wales; but still we import a good deal, and in times of good prices, at all events, it seems a pity that our own requirements are not met with the locally-grown article.

Even if prices fall again, it is worth remembering that the crop is an easy one to cultivate, and the large quantity of excellent seed produced is a good pig and poultry food.

Orchard Notes.

W. J. ALLEN.

JULY.

DURING this month considerable citrus fruit will continue to be handled, some for the local market and a large quantity for export. It will be necessary to see that the fruit is picked carefully, so that none of it will be bruised; also never pick immediately after a very wet spell, but allow the fruit to hang for at least two or three days, then grade and pack it neatly, whether it be for the local or export trade, and growers will find that they will be compensated for the little extra trouble entailed. Be most careful that the fruit for export has no insect or fungus diseases, as such fruits are prohibited from entering most of the other Colonies. It is well for the exporter to bear this in mind, as it is very disastrous to have a shipment condemned, because, in addition to the freight charges, there is the probability that some if not all of the fruit will be lost should the weather be unfavourable for keeping it.

Pruning will still be in full swing and I hope that none of the growers are neglecting this work. While the pruner is at work it is a good time for him to inspect each tree closely, especially peach, plum, nectarine and pear trees, for San Jose scale, and should any affected trees be found, these should be marked, and later on painted with pure kerosene—either in the latter part of July or the beginning of August—and if the work is carefully and thoroughly done, the traces of this pest on the trees so treated will disappear. I have experimented with this treatment on trees which were literally covered with the scale, and found it cleaned the trees. Before applying the kerosene I cut the tree well back, scraped off any loose and rough bark, then took a paint brush and some pure kerosene and rubbed the latter well into the bark, being careful not to miss any portion of the tree. In doing the work the oil should not be allowed to run down to the roots or it will damage them.

All prunings should be burnt as soon as possible after the trees are pruned. If the work is well done then, I feel sure that it will not be long before our orchards will be free of this much dreaded and destructive scale, and I feel sure that all of our most careful fruit-growers will, if they have trees affected by this scale, try to stamp it out now that we know it can be killed by this simple treatment.

At Bathurst orchard we have a three-year-old pear-tree on which San Jose scale had been found. The tree was painted with kerosene in the presence of about sixty farmers and fruitgrowers, many of whom considered that it would die. In December last it was again examined,

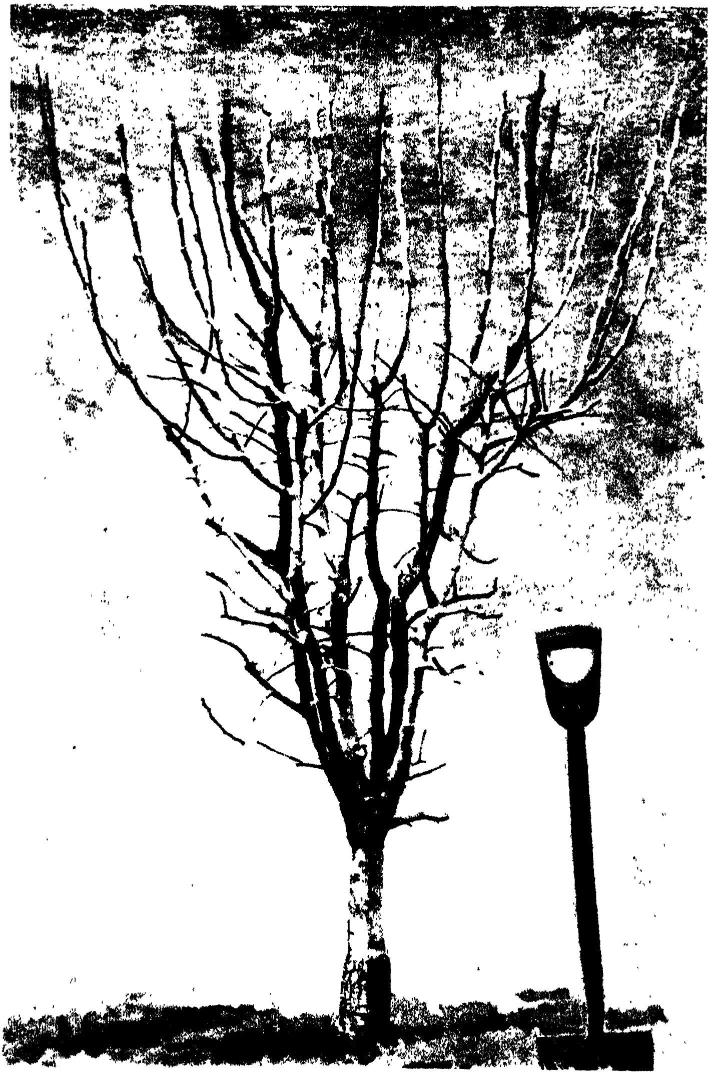


Fig. I. A THREE-YEAR-OLD PEAR-TREE IN WAGGA ORCHARD, PRUNED.

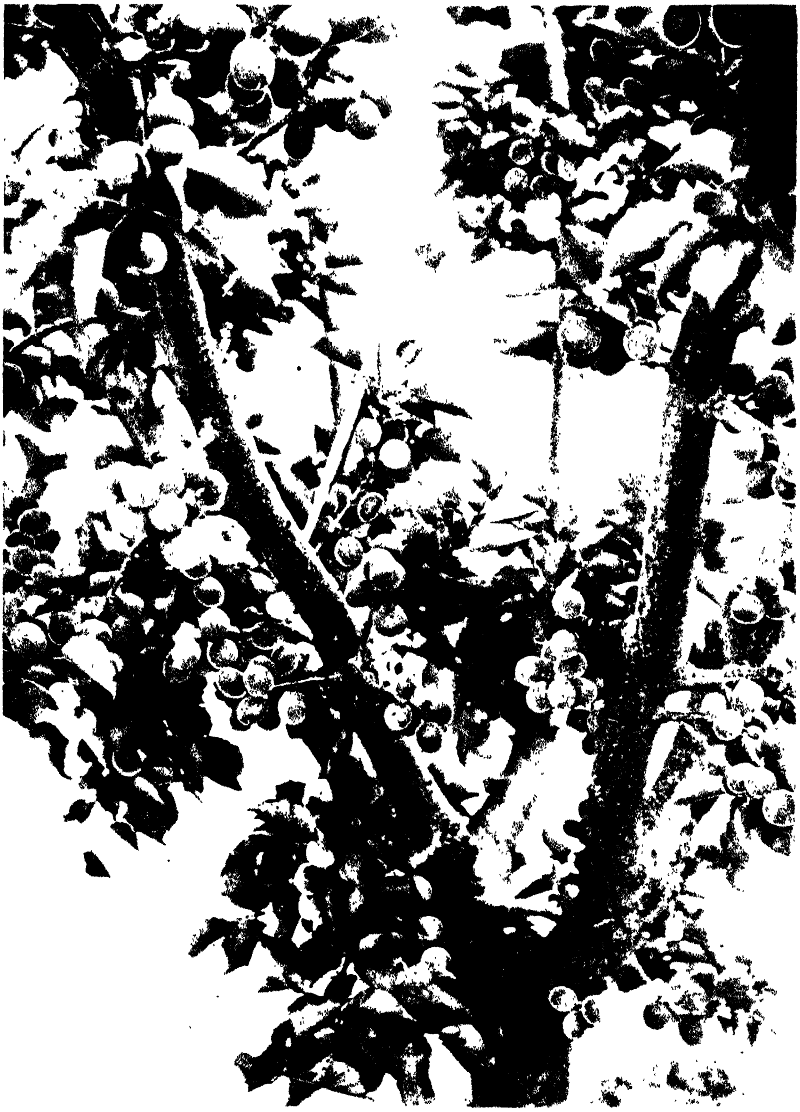
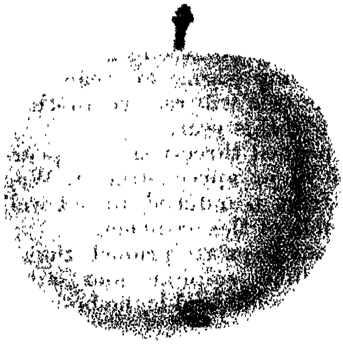
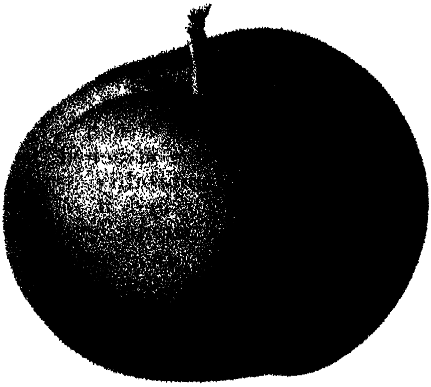


Fig. 11. AN APRICOT TREE AT WAGGA ORCHARD

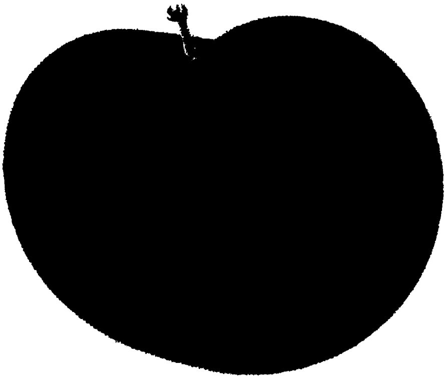
Showing how, by proper pruning, the fruit is induced to set well down in the tree instead of only on the ends of the branches.



GOLD.



SKIPPER.



H. S. BURTON, LITH.

OCTOBER PURPLE.

PLUMS.

and was found to have made good strong growth, and is at the present time entirely free from any signs of scale. However, to make assurance doubly sure, the tree will receive another painting with pure kerosene early in August of this year.

Figure I is that of a pruned three-year-old pear-tree in our Wagga orchard. Fig. II is that of an apricot-tree at Wagga, showing how, by proper pruning, the fruit is induced to set well down in the tree, instead of only on the ends of the branches.

As soon as the deciduous trees are pruned, they should all receive a thorough spraying with lime, sulphur, and salt. This is death to insect life and is a good fungicide, and is the best all-round winter spray which we have.

The planting of all deciduous trees should be completed as early as possible, as the roots of all these trees are making young growth.

If any trees were budded in the fall the limbs should be cut off just above the bud, and the cut painted with Stockholm tar.

Spring ploughing may be commenced immediately the pruning and spraying are completed.

I have to thank the following gentlemen for sending me good samples of their fruits, properly named, viz.:—Mr. Chas. Robinson of Gosford; A. Hunter, Gosford; A. Warfel, Dubbo; C. Packham, Garra; and Rev. Henry Woodhouse, Sackville Reach. I shall be pleased to receive samples of fruits, with names attached, from the different districts, with details as to their suitability or otherwise to that district. I would also ask those who find it necessary to forward fruits for identification to give as much detailed information as possible with each specimen, as there are so many varieties of fruits grown now that it is impossible for any one person to indentify half of those grown.

In reference to the *Prunus Simonii*, illustrated last month, Messrs. Arthur Yates & Co., wholesale seed warehouse, 184, Sussex-street, Sydney, write:—

> As we notice you give a plate and description of *Prunus Simonii* in the June number of the *Gazette*, in which it is recommended to be grown for marketing, we think that the results of our trials of this fruit at our Exeter Farm, near Moss Vale, might be valuable. We found it to be a very poor cropper, the fruit nearly all split just as they ripened, and while the flavour may be appreciated by the few, we found it to be heartily disliked by the many. While it may be worth while planting a tree or two as a curiosity, we would strongly advise growers not to plant it for marketing. We considered it so worthless we cut the trees out of the orchard.

REFERENCE TO PLATE.

Gold Plum.—Although this plum has been highly spoken of in America for its good flavour, it has not kept up its reputation here, as the quality of the fruit is not nearly so good as that of many other varieties. It is a heavy bearer, the fruit hanging singly all along its branches. A good cropper and shipper. Fruit light golden yellow, overspread with a hazy carmine blush.

Skipper.—A very prolific variety. Tree a strong grower. Fruit of large size, oval, light red with a nice light bloom. Flesh yellow, firm, sweet and juicy. A good shipper.

October Purple.—A large purplish plum. Tree strong growing and a heavy cropper. In some districts the fruit has a tendency to suffer from sunburn. When thoroughly ripe is of good flavour, and is worth a place in the orchard.

Practical Vegetable and Flower Growin

W. S. CAMPBELL.

Directions for the Month of July.

Vegetables.

The splendid rains which fell during the month of June throughout the Colony will give heart to those farmers and settlers who have been unable to raise any vegetables for some time. When the soil has become dry enough to work (for it is a very bad thing indeed to dig up soil for vegetables or anything else whilst it is wet), the seeds of many sorts of vegetables may be sown, and before long something will be available. Use abundance of stable manure if the soil should not be rich enough to grow vegetables well; and this is an essential thing, for vegetables are great feeders, and many of them—cabbage, cauliflower, leek, lettuce, and celery particularly—are able to make use of almost any quantity of good food.

Asparagus.—Prepare land for this vegetable, for next month it should be planted. Trench, and mix with the soil throughout plenty of dung, which may be applied as fresh as possible if no other is at hand.

Artichoke, Jerusalem.—Plant a few rows of this most useful and wholesome vegetable—one of the best, indeed, that could be grown. Obtain the white, smooth variety if possible, for it is far superior to the old kind, which bears numerous knobs all over the tubers which causes waste in the cooking. Manure well, and plant in rows 3 or 4 feet apart, 4 or 5 inches deep, and about 12 inches apart in the rows.

Broad Beans.—Should be bearing a good crop by this time. Sow a few rows more, to keep a supply going.

French Beans.—It would not be advisable to sow, except in the places where there is no likelihood of frosts injuring them.

Broccoli.—Sow some seed in a seed-bed and transplant with care to a well-worked small bed where the plants can grow well and strong before they are finally planted out. The little plants should be set out about 4 inches or so apart. Do the same thing with all the cabbage tribe of plants, and also with lettuce.

Cabbage.—Sow a little seed thinly in a seed bed. Try the variety known as St. John's Day for the summer crop, as it generally does better than any other kind.

Carrot.—Sow in drills, but not extensively, from 1 foot to 18 inches apart.

Cauliflowers.—Sow a very little seed in a seed-bed.

Cucumber.—Raise a few plants under shelter where no frosts can have access, and these can be planted out early in the spring.

Leek.—Sow a little seed in a seed bed. Strong young plants which have already been raised can be planted out in shallow trenches which have been heavily manured with rich dung. Plants which are well grown can be earthed up so as to make the stems white or blanched.

Lettuce.—Sow a little seed in seed-bed and plant out any young lettuces that are ready. Plant them with care.

Onion.—Sow as extensively as may be required in beds which have been well manured. Should there be prospects of much more rain, keep the beds well raised above the surrounding level, and see that the land is well drained, for onions will not succeed in ill-drained land—they will rot away. Make the surface soil quite fine before sowing, and then sow in drills, hardly covering the seed.

Parsnip.—Sow a little seed.

Peas.—May be sown extensively in rows 3 to 4 feet apart, according to the height the variety is likely to grow.

Spinach.—Sow a little seed in drills about 2 feet apart, and thin out well when the plants come up.

Swede.—Sow a little seed in drills.

Tomato.—Sow a little seed under some protection from frosts for early planting out.

As next month (August) will be the commencement of spring in many places, get land ready for the sowing and planting many of the winter varieties of vegetables. It is always a great advantage to be well ahead with this sort of work.

Flowers.

All kinds of deciduous plants—that is, those whose leaves fall off in the autumn—may be planted out. There are many most beautiful shrubs and small things in this section of plants. There are several species of low-growing magnolias, which do well in this Colony, well worth attention, and other species of plants, which I should like to write about, but only a very limited space is available for gardening in this publication. I may say, however, that of all the flowers known, the rose stands out prominently, and not even the smallest and most humble garden should be without some representatives. The rose may be planted out now if the soil is not too moist; and the sooner this is done the better. Pruning must not be commenced yet, or until the wood-buds begin to show signs of starting into growth.

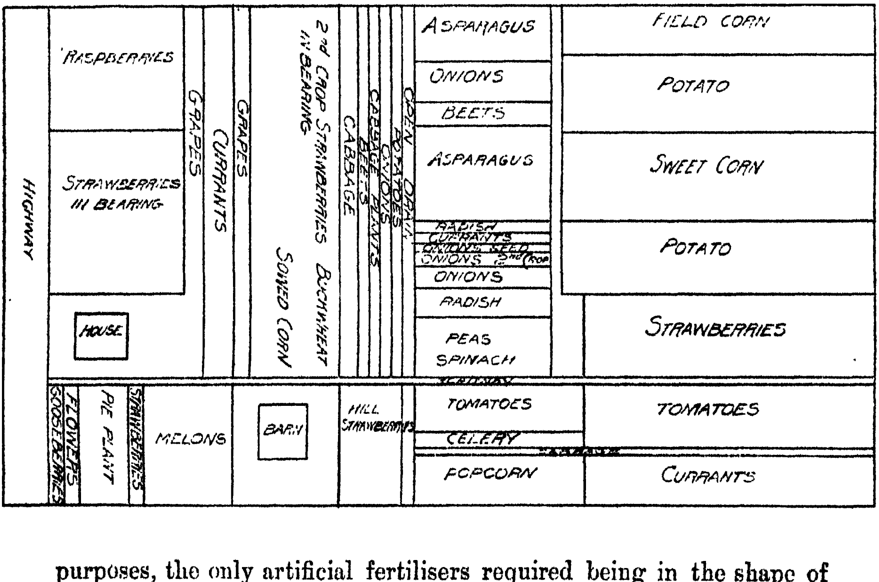
Early next month all sorts of evergreen plants may be put out, or this work may begin at the end of present month; camellias and bouvardias especially should not be forgotten. Chrysanthemum cuttings may be struck, and the new plants will succeed far better than old clumps, which may be dug up, a portion planted as a reserve, and the remainder given away to someone who needs a supply.

Seeds of half hardy and tender annuals may be sown in the warm districts of the Colony; and as soon as the plants are large enough to handle, plant them out.

General Notes.

A 5-acre Truck Farm.

Last season the proprietors of the *American Agriculturist* offered some prizes for the best tilled farms of various sizes. The plan reproduced here is of a 5-acre place which was awarded one of the prizes. The owners, Messrs. L. C. Wright and Son, do nearly all the work of cultivating and marketing the crops wholesale at Oswego, 3 miles distant. In addition to the various crops, a considerable income is derived from some pigs and fowls kept to consume the unmarketable odds and ends. The manure produced was almost sufficient for all purposes, the only artificial fertilisers required being in the shape of stimulators sown with the seed. For every crop the ground is thoroughly prepared by deep ploughing and harrowing. Small, narrow teeth are almost entirely used on the cultivators. In this diagram the feature that should be of most interest to New South Wales agriculturists is the shape of the areas devoted to such crops as require frequent hoeing. Where the plots are made long and narrow it is easy to work them with horse labour; and the risk of the horse becoming fretted and unmanageable in consequence of short turns can be avoided.



ABOUT GRASSES.

THE following letters have been received by the Manager of the Experimental Farm, Wollongbar, Mr. H. V. Jackson:—

Mr. Chas. Alison, Wyong, writes:—"7th May, 1900. I must apologise for not having written to you before to thank you for your advice *re Paspalum dilatatum* grass, and for sending on the roots. We had three months dry weather after planting the roots, so that about 25 per cent. died, but the remainder look very healthy, and have grown well since we had a few showers, and I am certain it will be a success. I sowed some seed last September on some roughly turned-up couch land, and did not see a trace of it till January, when I noticed it, and now it is apparently smothering out the couch, and growing strongly. I am so pleased with it that I shall put in a larger area next spring."

Mr. George Morris, Hop Grove, Gum Flat, *via* Inverell, writes:—"25th May, 1900. I herewith forward a report on the grass you sent me in November last. The *Paspalum* has more than fulfilled my highest expectations, under very trying conditions. During January and February it was very dry and hot, and everything else was fairly burnt up; but the *Paspalum* stood it most wonderfully well. It was the only green thing on the place, and produced a crop of seed at the same time. I believe it is the first that has been grown in this district. *The Texas Blue-grass.*—Well, I thought it was dead altogether, but not so, for when the hot weather was over, and we got good March rains, it came up splendidly all over the bed. The roots must have been growing while the tops were dead."

THE BURRAWANG AND RICKETS IN CATTLE.

MR. GEO. BRYANT, of Saltash, in a letter to Mr. J. H. Maiden, Government Botanist, says: "I see by the *Agricultural Gazette* of December, 1899, Part 12, Vol. X, you ask graziers if the eating of Burrawang plants or roots by cattle with injurious effects was new to them. It is new to me, as you will see by these few lines. I selected land in this district on 27th February, 1879, and I have resided on it ever since. In that time I have lost over two hundred (200) head of cattle with the disease called 'rickets,' or better known in this district as "cramps' or 'dry bible.' From 1879 to 1884 my cattle died like rotten sheep, as the saying is. From 1884 to 1888 I had little or no losses. In January, 1890, the disease returned, with a loss of thirty head for that month. I have Burrawang growing close to my house, and I have never known my cattle eat it. I have held *post-mortems*, I may say by the score, and I never have found any trace of Burrawang in any case. I believe the disease originates in what I call the 'bible.' The food that the cattle eat is so hard and dry that the cattle cannot digest it. I have had cases in which the "bible" was so clogged that I could not clean it out without a knife. It was very hard and dry, and looked as if it was burnt, being as black as coal. I have seen the liver and kidneys very pale and white. I have found the urinary organs in a very bad state, the water having a very bad smell at first, and then becoming thick and oily. At first it comes in small gushes, and then it begins to dribble constantly, and as the disease advances it slows down to a drop, drop, until the animal dies. The bones become very soft, with very little marrow in them—only a filthy matter, mostly composed of blood and water. I have known cattle to be walking along a good clean road make a stumble, and when I went to their assistance I found a leg broken—actually smashed, as if it were rotten. That is all I know about the diseased parts.

"I will give you some of the symptoms as the trouble first affects the cattle: First, the solid secretions become very hard and dry, with a slimy skin covering and intermixed with them. Secondly, the cattle become stiff and cramped, with a great trouble to lie down, but they can get up again quite easily at this stage of the disease. Third is figure 2, as shown in *Gazette*, Part 11, November, 1899 [reproduced opposite]; and fourth is figures 3 and 4, as last stages. These symptoms are in cases where cattle are brought from good country and depastured on crampy country.

"There is another form of the disease. The symptoms are the same as in figures 1, 2, and 3, 4; the water secretions become gushy, and then dribble until death. This is the more difficult to treat of the two cases. I had a case of this kind; the cow was bad for over two years and then died. They seldom recover from this form.

"The only remedy for the diseases, so far as I know as yet: As soon as detected (that is, the symptoms, figures 1, 2, 3) remove the cattle, and put them on good, soft, young, green feed. If that is not available, give plenty of bran and pollard. I will give the Moruya settlers, or any others who are in trouble with this disease, my advice—that is, to keep their cattle off 'crampy country.' Prevention is better than cure. If they cannot keep them off, they must not on any account let them on it except in May, June, and July, for if the summer is hot and dry they will be in trouble.

"In concluding this, I would say that this disease offers a great field for scientific investigation. There are several settlers in this district who have had trouble with this disease for a longer period than I, some of them thirty to thirty-five years. It is almost periodical here. It is the worst in September, October, and January."

DESTROYING PATCHES OF SORREL AND COUCH.

THE appearance of little patches of sorrel and couch in land that receives even pretty frequent attention is familiar enough to most orchardists. At first the patch seems so insignificant that it is hardly worth bothering about, but by next season we will probably find that the spots have multiplied, and are scattered throughout the orchard.

The usual plan of getting rid of such troublesome plants is to let them take their chance of destruction in scarification of the land. That such a method is a good one is open to doubt. The more you hack and tear at sorrel and couch the better they thrive, and the minute particles of rooted stems and feelers that are detached from the main group are carried by the scarifiers to other parts of the orchard, where

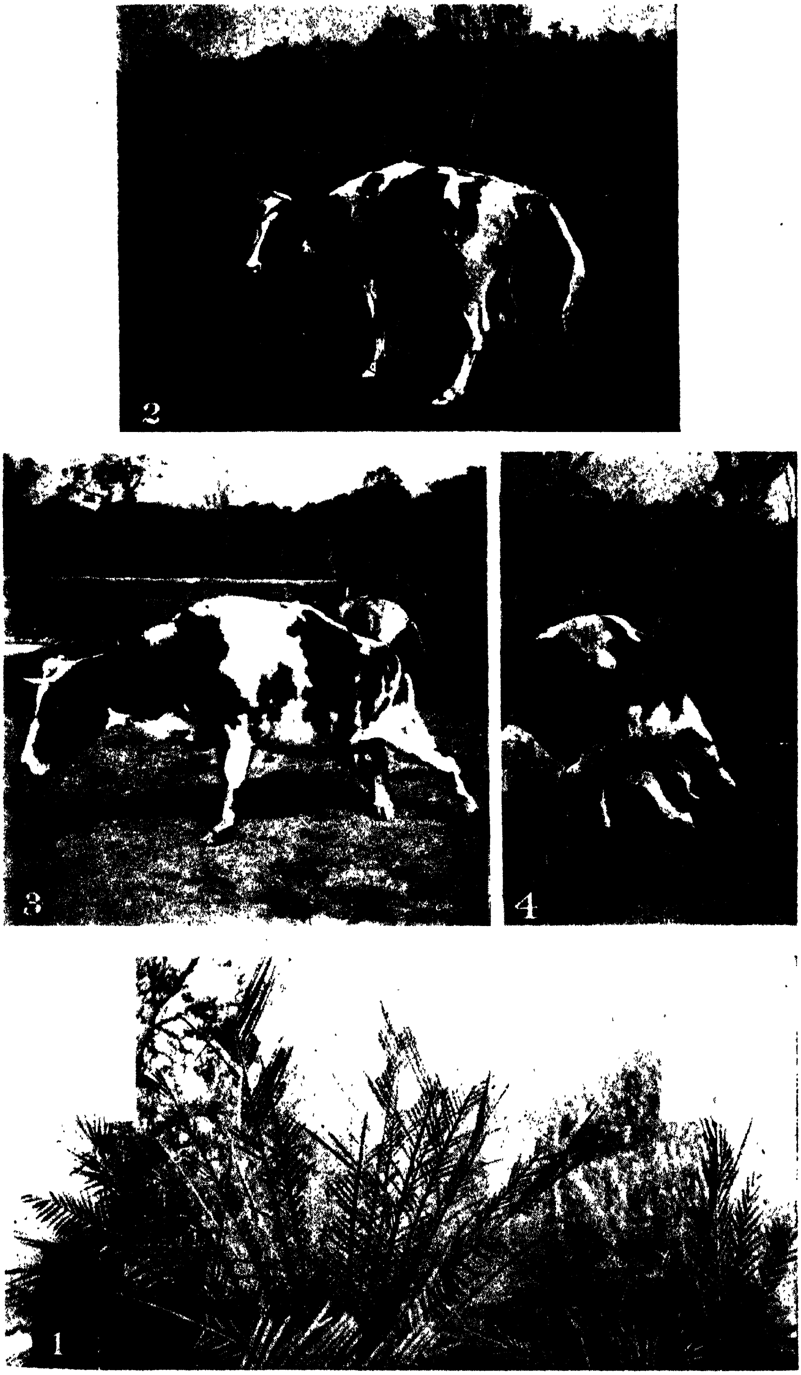


Fig. 1.—The Burrawang showing evidence of having been eaten by cattle. Fig. 2.—A heifer in the first stage of the disease. Fig. 3.—An aged cow in an advanced stage of the disease, trailing hind legs behind her. The two animals in the background are also affected. Fig. 4.—A cow in the advanced stage about to knuckle over at hind fetlocks on being turned round sharply.

they take root and establish fresh patches. Moreover, the eradication of either of such pests by scarifying alone is a tedious process, and can rarely be accomplished under two or three seasons. If the work can be taken in hand as soon as the first few patches show up, the pests can be most effectually got rid of by going over the area and digging out the patch, throwing plants and soil into a barrow or dray, and carting it clean off the cultivated ground. When the plants are torn out by the roots, or removed without the lump of soil wherein their roots are spreading, the evil is simply aggravated by the scattering of pieces that will grow all over the place.

Where the pest is well established, it is well to plough the land and leave it in such condition that the roots will be exposed as much as possible to frost during the winter, and in spring and autumn, when both the sorrel and couch are shooting vigorously, to plough the land again carefully so as to turn the plants well under, and pop in some vigorous crop, like oats, that will smother the pests.

In America, orchardists and farmers have great trouble with what they call quack grass, which soon over-runs and takes complete possession of cultivated land. According to Mr. R. Waugh, in the *Agricultural Journal*, the smothering system is found to be more effective than any other. The grass turned under rots for want of air, and the roots turned to the top cannot throw out fresh root stocks if not disturbed, as they would be if the crop were not there and scarifiers were used. A few roots may escape if the ploughing is of the pig-root style, or if the quantity of seed sown is insufficient for a dense covering of the ground.

ONION CULTURE.

ONIONS, like some other farm crops, require a large amount of labour to give the best results. But if given good cultivation and the weeds are kept down, they make nice large onions. On the average farm, onions are grown from sets, but the best are produced from seed, as there are not enough sets to go round. I have grown them from seed, and have experimented on a small scale with planting the little ones the second year. This plan gave good returns, but I could not get enough little onions.

The soil for onions should be fertile, sandy, well underdrained so that it will not pack after every rain. It is best to apply a good coating of barnyard manure, but a great objection is that it always contains a large amount of weed-seed. A fair amount of sand is an advantage if the soil is sufficiently retentive to resist droughts.

Begin to get the soil in shape two or three years beforehand. First sow as much clover as possible, to increase the fertility of the soil. Also plant hoed crops to kill out as many weeds as possible, for weeds are one of the greatest barriers to success. Barnyard manure and hen manure are good fertilizers to be applied before planting. For the onions to make a good growth, the ground must be ploughed as early as possible, about the last of March, and not later than the 30th. They will make a crop planted a month later, but they will get only half as large. The ground cannot be in too fine a condition, and should be harrowed and dragged several times. I get the ground as free from clods and trash as possible, frequently raking it with a common garden hand-rake.

To plant the seed, I use a garden drill, which marks the next row, has an adjustable shovel, and plants uniformly. I drill the rows about 13 inches apart, planting six to ten seeds per foot. I would advise every farmer who plants very much garden to buy one of these drills, which sows any sized garden seed. I cultivate the onions as soon as they are large enough. The ground soon packs and the weeds make an early start. They should be cultivated at least after every rain, as the ground then runs together and crowds the young plants. They also have to be hand-hoed, as the weeds cannot be ploughed out of the row. For getting rid of these weeds I sometimes use a common knife. It is very hard work, whatever is used.

The cultivator we use runs astride the row, and is a double-wheel hoe with double hoes. It has several attachments, some cutting horizontally and some cutting vertically. The former are best for cultivating the plants when small, because they throw the dirt away from the row. When the bulbs begin to enlarge, the latter may be used. The onions are pulled as soon as the tops turn yellow. Then they are topped and dried and laid away on shelves so they will not heat.—C. C. BEALS.—*American Agriculturist.*

PLOUGHING UNDER GREEN CROPS.

IN an address delivered before the Annual Congress of the Connecticut Horticultural Society, Mr. Walter F. Faber, of New York, advocated the practice of turning under green crops. He said :—

"I have changed a hard, compact soil, incapable of sustaining a crop in seasons of drought, to one of great fertility, on which large and paying crops have been grown. This has been accomplished by a gradual deepening of cultivation and the ploughing under of heavy growths of clover and rye, thus adding large amounts of vegetable matter to the soil, which, with proper surface cultivation to prevent evaporation, has so retained and conserved the moisture in the soil as to grow magnificent healthy crops upon it in seasons of severe drought. As we turn under this mass of matter to the depth of about 12 inches decomposition takes place, moisture is drawn up from the subsoil, obtained from the humus and supplied to the growing crop.

"A most striking instance of the value of this supply of moisture was shown where a heavy crop of rye was turned under 12 inches deep and the ground set with strawberry plants early in May. Weather conditions were favourable up to June, but from that time until September practically no rain fell. Shallow cultivation was kept up to prevent evaporation. Below where the soil was stirred there was moisture, and the strawberry plants had been supplied with that moisture, so that each plant had thrown out runners and grown from fifteen to twenty new plants, all supported by the moisture supplied to the parent plant. The surface soil was so dry that not a single root had been developed upon these young plants, but they soon rooted after the rains came.

"In another instance I ploughed under a heavy growth of clover about the last of May and planted evergreen corn. A slight rain fell the day after planting, wetting the ground about 1 inch deep. No more rain fell to a like amount in two months, yet the corn grew rapidly, maintaining a green, healthy colour, when all other fields were growing yellow and drying up. The result was satisfactory, as the crop netted over 100 dollars per acre. This method of conserving and retaining moisture can be practised by every cultivator of the soil. Provide plenty of vegetable matter, whether it be in the form of green crops or stable manure. Cultivate deeply and thoroughly before planting in shallow ground and often after planting."

PREPARATION OF WHEAT FOR SOWING.

MR. WILLIAM WEIR, of Craigdon, Armidale, writes: It is many years since I first began to note the great loss of grain by the use of sulphate of copper (bluestone). I tested all the different systems I could hear of treating seed for the prevention of smut. I found that when I dissolved bluestone in, say, two gallons of water, and sprinkled it over a bag of wheat, covering till next morning, any grain that had been the least damaged during threshing was injured the most. So until a short time ago I have adopted the cask system, which allows of a weaker solution which is not so hurtful to the grain, still I never was satisfied with the bluestone as a steep. I tried sulphate of iron (copperas). I tried it on a small scale for two seasons, and was satisfied with it. Last season I used copperas for all my seed wheat, and was more than pleased with the result. From my experience I can recommend the general use of copperas in place of bluestone. I may say that I spoke to the late Mr. J. L. Thompson about this matter last summer, and promised to report the results of my experiments.

My system is as follows: I place my cask on a stage a little higher than a half-cask that I use to run off the liquid into. In the first steep I use 2½ lb. of copperas, immersing the grain for six to eight hours. In bottom of cask I have a 1¼ in. hole for running off the liquor. When I pull at the plug, I push into the hole a handful of green twigs doubled up, so that while the liquor runs out freely little or no grain can escape. In the second steep I use 1 lb. copperas only. When the wheat is emptied out I sprinkled over and mix well with it about 3 quarts of slacked lime, not only to dry the grain, but also to protect it when sown. In certain seasons, especially wet ones, there is often a cry that a deal of the young wheat has died off, and no one knows the cause. If the young stalks were examined in the mornings there would be found numbers of very small red worms, fine as needles, from three-quarters to one and a half inches long, which are the cause of loss of young wheat. I might also mention that wheat treated with copperas will start to germinate at once. The mixture may stand for a time and remain fit for use.

This communication has been brought under the notice of the wheat experimentalist, Mr. W. Farrer, who is conducting experiments with the object of determining the best means of preventing smut and bunt. Mr. Farrer has already noted that a 2 per cent. solution of sulphate of iron has been recommended in Griffiths' work, and he now proposes to test Mr. Weir's plan.

LUMPS ON COWS TEATS.

A CORRESPONDENT residing in one of the oldest dairying district writes: On page 363 of the *Gazette*, in a report of a paper read by Mr. Albert Williams, of Tarro, before a meeting of the Hunter River A. and H. Association, I see that Mr. Williams said, "he had experienced cows getting lumps on their teats but could not account for it."

Mr. Arthur Lee said: "In conversation with a gentleman well versed in the science of dairying, he had been informed that the cause of this was stripping the cows every day before turning them out."

As this statement might tend to mislead a novice in dairy-farming, I think it only right to say that a careful dairy-farmer regards the thorough stripping of the teat as one of the most important points in milking.

If you do not strip your cow out she will gradually decrease in her supply of milk, and more than that you will lose the richest part of it, and, of course, so much profit.

I have made careful inquiry as to the lumps on the teats, and I am convinced that the cause is—*too severe handling*. This, of course, is most apt to take place during the stripping out process; and is, no doubt, what the gentleman quoted by Mr. Lee meant.

One farmer told me that he has noticed that the cows in his herd, milked by a man who has very strong wrists, will have lumpy and sore teats when they come in again, while those milked by himself and the boys will be all right. He says that the teat is injured by being roughly dragged down between the finger and thumb in stripping. You must strip thoroughly, but you must learn to do so without unduly stretching or jerking the teat. My inquiries are made in one of the oldest dairying centres in the Colony.

In a second communication this correspondent says:—Since writing a few days ago I have heard of a cow which had developed those lumps, and I went out to have a look at her. On speaking to the farmer he said, 'Cows never have them except at their first milking'—that is to say, after their first calf; but those who have had experience in other districts do not agree with this. I know them on this particular farm to be very gentle with their cattle, and careful milkers, and I came to the conclusion—I do not know how correctly—that for that reason only the very young cows suffered, they necessarily requiring even more gentle handling than the rest. The cow under inspection is very young, not full grown—far too young to be milking, in fact.

THE BENEFIT OF MANURE.

THE same gentleman forwards a photograph of a crop, which he may well call "An object lesson in manuring." It shows the corner of a paddock, which paddock was planted with corn, the portion shown being left vacant for the planting of pumpkins, which was duly done, about a table-spoonful of manure (phosphate—I give you the analysis,*) being put into each "hole." Owing to drought the pumpkins were a partial—only a partial—failure. After they and the corn were gathered, the paddock was ploughed and sown in oats for green winter feed, with the result you see. The extraordinary-looking hills of luxuriant feed, towering over the surrounding growth, are over the old pumpkin holes. I should say one stalk of the latter was worth about ten in the unmanured portion—and yet you will have farmers arguing that these manures 'don't pay'; some will make the excuse that they 'eventually† inpoverish the soil'; but there is no question of that in this instance—it is of a poor sandy nature, and you could not possibly inpoverish it if you tried. Of course I know that you cannot beat the stable and cow-yard manure; but on large pastures you cannot get enough of this to go round, and you can help it a lot artificially.

"At present I am trying the effect of artificial manures in getting the rye-grass to 'hold' again in paddocks where it has been grown for many years, and now declines to stay. When you are writing on the renewal of pastures, I shall be glad to give you the result of my small experiment. So far, two out of three of my plots are head and shoulders above 'no manure,' which is gratifying; but that is not the object with *grasses—permanence* is what I hope to attain; and this means patience and much careful record-keeping, which one must do *one's self*. The expense, too, is an object where one has no direct benefit in view."

WHEAT TRIALS.

MR. J. M. BROADHEAD, of Bungonia:—It is with keen interest I watch for the *Gazette* every month; the valuable information is read with great interest.

We have now sown on our farm nine different kinds of wheat; four kinds we got this year from Wagga Experimental Farm, and one kind amongst those four I noticed in *May Gazette* is commented on in a report on wheat trials by the Leech's Gully Farmers' Union, or Farmers' Friend, and described as useless to sow in that district, on account of its liability to rust. The other three kinds from Wagga

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* SUGAR COMPANY'S "No. 12."

Bone phosphate, soluble	12
,, insoluble	20
Phosphate, soluble by root absorption	5
Ammonia	4
Potash (pure)	2

† The majority, however, have never experimented enough to know anything about it.

Experiment Farm are Hudson's Early Purple Straw, Golden Drop, and Zealand. Amongst other kinds we have is Manitoba, which we have in for the fourth year. We have so far, proved that it can be grown in this district with success. I intend sending a report of those wheats to the *Gazette* next year.

I also read with interest Mr. Farrer's report on experiments with bunt or smut in wheat; his experiments were severe tests I admit. I have had a deal of experience with bluestone, in fact, from boyhood; but for the last twenty years, that portion of the farm work has been entirely in my hands, so I can speak with some experience. I always blue in a cask half bag at a time, bag and all. The first time I dissolve 4 lb. of bluestone, fill my cask half full of water (about 14 gallons) then add the dissolved bluestone, put my wheat in and let it soak for one hour. I lift it out over the cask with a lever and drop in another bag, letting the first one drain over the cask; when I take the second one out, I shoot the first one in another empty bag, put it in the barn and it is ready to sow next day or any time after. I then add 1 lb. of bluestone with about 4 or 5 gallons more water; it is then ready for two or three more half bags. I then add more bluestone and water whenever needed. With this mode of treatment we never have any smut. I am of the opinion bluestone will prevent bunt if done in this way (I will not say cure, for I do not approve of sowing diseased grain). We have a few acres in this year which will test the value of our mode of treatment upon wheat we purchased from a neighbour with a few smut balls in it, to test. We sowed one bushel to the acre, and it is up plenty thick enough, thus proving that we did not kill much in the bluing. I intend sending the result of this trial to the *Gazette* for the benefit of my fellow farmers.

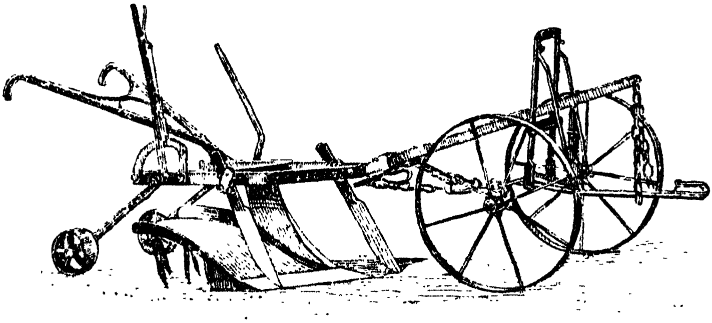
THE DETERIORATION OF PASTORAL COUNTRY.

Mr. T. E. Grigg, President of the Farmers' and Settlers' Assoc., Nyngan, writes:—"I read with great interest the article by J. D. M. in the April *Gazette*, and I am sure the majority of practical men will agree with him. There is no doubt that over-stocking has ruined hundreds of thousands of acres of land in the past, and the process is still going on. The writer (J.D.M.) asks where are the saltbush and cotton bush plains? Gone, or going fast, is the answer; and if something is not done soon to check their wholesale destruction, it will be a case of going abroad to see saltbush. Take the lands bordering the Western Division—say from Nyngan—and keep east of the Bogan, you will find that where once there were thousands of acres of saltbush, now it is only found in the horse paddocks. The same disappearance is taking place on the Marra and Macquarie River country. Saltbush, bluebush, cotton bush, and every description of edible scrub are going, and no attempt is made to conserve any one of them. What can one say to the reckless destruction of edible scrub? Why, in this district there are thousands of acres of scrub felled to the ground—no lopping, no thought of another drought; and, worse still, no provision made to replace any one of these valuable plants or scrubs. I think that the

State, as landlord, should see that the public estate is protected, for when once we kill all the saltbush, cotton bush, and edible scrubs, what will our western central plains be fit for? Every year sees the scalded plains growing bigger and bigger; every rainfall sees the surface soil swept away, leaving a sour subsoil behind, for the want of plant-life to bind the loose surface soil together. The remedy I would suggest is light stocking—for we must recognise that saltbush country is very light-carrying country—a systematic cultivation of saltbush, and a stringent law against falling edible scrub, which should be only lopped, and the protection of all young trees of edible varieties."

AN EXPERIMENT WITH A TURF PLOUGH.

MR. W. SOMERVILLE has reported to the *Journal of the Board of Agriculture*, England, the following results of an experiment to determine the merits of the turf plough here illustrated. He says:



"Of late years much attention has been given to the improvement and renovation of grass land. As a rule the accomplishment of the object has been attempted through the agency of manure, though not unfrequently one hears of good results attending purely mechanical methods, such as scarifying. It is generally believed that this method of renovation depends for its success partly upon the removal of moss and dead grass, but chiefly upon the improved aeration of the soil as a consequence of the surface being torn by the tines of the harrow or other scarifying implement.

"In the *Deutsche Landwirtschaftliche Presse*, of March 7th, 1896, an entirely novel implement was figured and described by Professor Streckeo, of Leipzig, under the name of Laacke's Wiesenschälpflug. This implement has much that is attractive about it, and a specimen was obtained for use on Cockle Park in November, 1897.

"It cuts a strip of turf fully 12 inches wide, and varying in depth from 3 to 6 inches, raises it clear of the ground, stirs the soil underneath or not—as may be desired—and replaces the turf in its original position. Its weight is under 3 cwt., and the price £5 10s. In land that is fairly clear of stones it does its work perfectly, is not a heavy draught for two horses, and gets over about 2 acres daily. The accompanying illustration shows the implement ready for work."

"The immediate results of the work of this plough are:—

(1.) Air is admitted freely to the soil to a depth which is usually about 3 or 4 inches.

(2.) The roots of all plants are cut at a similar depth.

(3.) The soil, to the depth of 2 inches or so below the lower surface of the 'furrow,' is loosened, or otherwise, as desired.

"In November, 1897, the plough was used on a few acres in two pasture fields in Cockle Park. It was tried upon land that had previously been treated with phosphates and on land that had received nothing, and it was used with and without an accompanying dressing of basic slag. In one case the basic slag was introduced underneath the turf at the moment when it was passing over the breast of the implement. So far as ocular inspection can be depended on to determine the result little, if any, benefit to the pasture has followed the use of the implement.

"In order, however, to bring the results to the test of definite figures, the plough was also used in certain half-acre plots in a grass field that is annually cut for hay. This field has been sown down to grass for about twenty years, and represents a poorish type of meadow. The soil—a moderate loam resting on boulder clay—is one that might be expected to benefit from æration. The manures in each case consisted of a mixture supplying per acre ¾ cwt. sulphate ammonia, ¾ cwt. nitrate of soda, 1½ cwt. basic slag, 1¾ cwt. superphosphate, and 1½ cwt. sulphate of potash (50 per cent. purity). The basic slag and sulphate of potash were applied immediately after 'ploughing' in November, 1897, and again in the autumn of 1898, while the other substances were applied towards the end of March in the succeeding spring of each season. Details of the treatment are shown in the table:—

"*Result of using Laacke's Turf Plough.*

Plot.	Treatment for Season 1898 (the manuring was for both 1898 and 1899).	Yield of Hay.			Botanical Analysis, 1899.								
		1898.	1899.	Total.	Dogstail.	Fescues.	Fiorin.	Vernal.	Yorkshire Fog.	White Clover.	Ribwort.	Various.	Total.
		cwt.	cwt.	cwt.									
1	'Ploughed," soil stirred, manured, not rolled	34	24¼	58¼	14·7	11·2	38·3	1·8	10·7	2·7	1·4	11·2	100
2	'Ploughed,' soil stirred, rolled, manured	37	23¼	60¼	18·7	9·2	31·8	3·0	26·2	2·6	2·3	6·1	100
3	'Ploughed,' soil stirred, rolled, not manured	22	15½	37½	22·0	9·4	32·5	1·6	21·0	1·8	3·1	8·6	100
4	Neither 'ploughed,' stirred, nor rolled, but manured	50	24¾	74¾	14·1	11·0	31·9	3·1	21·6	3·6	4·4	10·3	100
5	Altogether untreated	34½	16½	51	16·2	7·8	35·6	2·5	15·7	4·5	5·0	12·7	100
6	'Ploughed,' rolled, manured, not stirred	39½	25	64½	10·1	10·4	33·5	1·6	29·1	3·7	2·7	8·9	100

"The effects of the treatment on unmanured ground are seen by comparing plots 3 and 5.

"On plot 3 the turf was 'ploughed,' the soil underneath was stirred, and the land was subsequently rolled, with the result that in the first season the hay crop was reduced from 34½ cwt. to 22 cwt., while in the second season the reduction was from 16½ cwt. to 15½ cwt.

"A comparison of plots 2 and 4 will show what the plough was able to accomplish, when accompanied by manure. The use of the implement—with simultaneous stirring of the soil and subsequent rolling of the land—resulted in a reduction of the crop in 1898 from 50 cwt. to 37 cwt., while the yield in 1899 also suffered to the extent of 1½ cwt. per acre.

"It will thus be seen that, whether used alone or in conjunction with a dressing of artificial manure, the plough has very seriously reduced the yield in the first season, while its prejudicial influence is still observable, though not to so great an extent, in the second year.

"Seeing that the plough has failed to improve the yield, but little practical interest attaches to the effects of rolling or stirring. It may, however, be pointed out that rolling (compare plots 1 and 2) cannot be said to have had any marked effect, but stirring the soil (compare plots 2 and 6) has, in both years, reduced the yield to the extent of about 2 cwt. per acre.

"In the season immediately succeeding the autumn in which the work was done, it was very evident that the treatment had materially affected the relative abundance of the various plants, and, more particularly, the scarcity of ribwort on the 'ploughed' plots was very conspicuous. This result might have been anticipated when it is remembered that this plant has a very pronounced tap-root, which would, of course, be severed by the share of the plough. The botanical analysis of the herbage of 1899 shows that seven plants constituted about 90 per cent. of the total weight of material. Of these, comparison of the respective plots will show that 'ploughing,' combined with stirring and rolling, resulted in a reduction in the case of fiorin, sweet scented vernal, white clover, and ribwort, whereas there was a marked increase of crested dogstail and Yorkshire fog. The various species of fescue were, on the whole, but little affected.

"If the average of plots 2 and 3 be compared with that of plots 4 and 5, and if the percentages of the various plants be converted into actual weight per acre, we have the following results :—

	Pounds per acre of the undernoted Plants in 1899.						
	Dogstail.	Fescues	Fiorin.	Vernal.	Yorkshire Fog.	White Clover.	Ribwort.
'Ploughed,' stirred, and rolled (plots 2 and 3)	443	203	701	50	515	48	59
Not ploughed, stirred, or rolled (plots 4 and 5)	347	216	774	64	427	92	108

"Finally, it may be interesting to note whether artificial manures acted better on such "ploughed" land, or on ground that had not been disturbed. The following figures show the increases per acre due to manure:—

	1898.	1899.	Total.
	cwt.	cwt.	cwt.
Manures applied to 'ploughed' ground (compare plots 2 and 3)...	15	7¾	22¾
Manures applied to 'unploughed' ground (compare plots 4 and 5)...	15½	8¼	23¾

"The results, it will be seen, are each year slightly against the 'ploughed' ground, so that not only is the ploughing it itself harmful, but it also prevents manures exercising their full effects."

The results, as reported by Mr. Somerville, are certainly not very encouraging, but it would be very interesting to know what would be the effects of such an implement, or one working somewhat on the same principle, on some of our very old grass paddocks. For one thing, it might be possible with the aid of such an implement to get rid of tussocks, which would be severed from their roots by the flat share, and could be then readily dragged out of the ground with harrows. The idea of shaking up the turf a bit, and ærating soil that is compact and hard with perhaps a quarter of a century's constant tramping and grazing, seems likely to be productive of good results, and although the contrivance now under notice may not completely fill the bill, it is to be hoped that before long somebody will come along with an implement that can be used for the treatment of unproductive pastures. Possibly ploughing the land and re-seeding is best, but the trouble is very often that in ploughed land useful grasses and herbage get crowded out with useless weeds that come from goodness only knows where.

REPORT ON THE SOIL OF PERA BORE FARM.

THE Chemist, Mr. F. B. Guthrie, has furnished the following report on samples of soil from the Pera Bore Farm:—

Mechanical Analysis.

Root fibres	·12	per cent.
Stones over ¼ in. diameter	·00	,,
Coarse gravel, more than 1/10 in. diameter	·12	,,
Fine gravel, more than 1/50 in. diameter	·91	,,
Fine soil { Sand	79·04	,,
Fine soil { Impalpable matter, chiefly clay	19·81	,,

Analysis of Fine Soil.

Moisture	3·21 per cent.
Volatile and combustible matter, principally organic	3·94 ,,

Fertilising substances soluble in hot hydrochloric acid of 1·1 specific gravity.

General Value.

Lime (CaO), ·135 per cent., satisfactory, equivalent to 3,329 lb. (*a*) in an acre of soil 6 inches deep.

Potash (K_2O), ·356 per cent., good, equivalent to 8,780 lb. (*b*) in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5), ·249 per cent., good, equivalent to 6,141 lb. (*c*) in an acre of soil 6 inches deep.

Nitrogen, ·028 per cent., deficient, equivalent to 690 lb. (*d*) (equal to ·034 per cent. ammonia) in an acre of soil 6 inches deep.

Note.

(*a*) This amount of lime would be supplied in 3,698 lb. of quicklime, or 4,993 lb. of slaked lime, or 6,658 lb. of chalk.

(*b*) This amount of potash would be supplied in 17,560 lb. of commercial sulphate of potash, or 73,137 lb. of kainit.

(*c*) This amount of phosphoric acid would be supplied in 24,564 lb. of commercial bone-dust, or 36,846 lb. of superphosphate.

(*d*) This amount of nitrogen would be supplied in 3,450 lb. of sulphate of ammonia, or 4,140 lb. of nitrate of soda.

The soil, as will be seen, is rich in mineral plant-food, its principal defect being its low content of humus or vegetable matter, to which is due its deficiency in nitrogen and its low capacity for retaining water. The soil does not show any strong alkaline reaction, but it has the objectionable property of becoming hard when moistened and allowed to dry. Mr. Gorman states that he found it necessary to use a crowbar in order to obtain the sample. This is a state of things commonly observed in alkaline soils.

The alkalinity was too small for its amount to be determined with accuracy, and in this respect it is similar to samples from Pera Bore examined for the P.W.P. Branch which were taken from the "Nursery Area," "Lucerne Plot," "Planted with Adriatic Fig," &c.

The only prejudicial action of the irrigating water is apparent in the tendency of the soil to become hard, and in the small proportion of humus and nitrogenous matter. This latter defect may, however, be due to the original poverty of the soil in vegetable matter, and not to the corrosive action of the water. The water has been of benefit to this extent, that the amount of mineral plant-food, potash, phosphates, &c., has been increased.

The only danger to be feared in the continued use of this water is that the soil may become hard, as reported by Mr. Gorman, and that tillage operations may be rendered difficult.

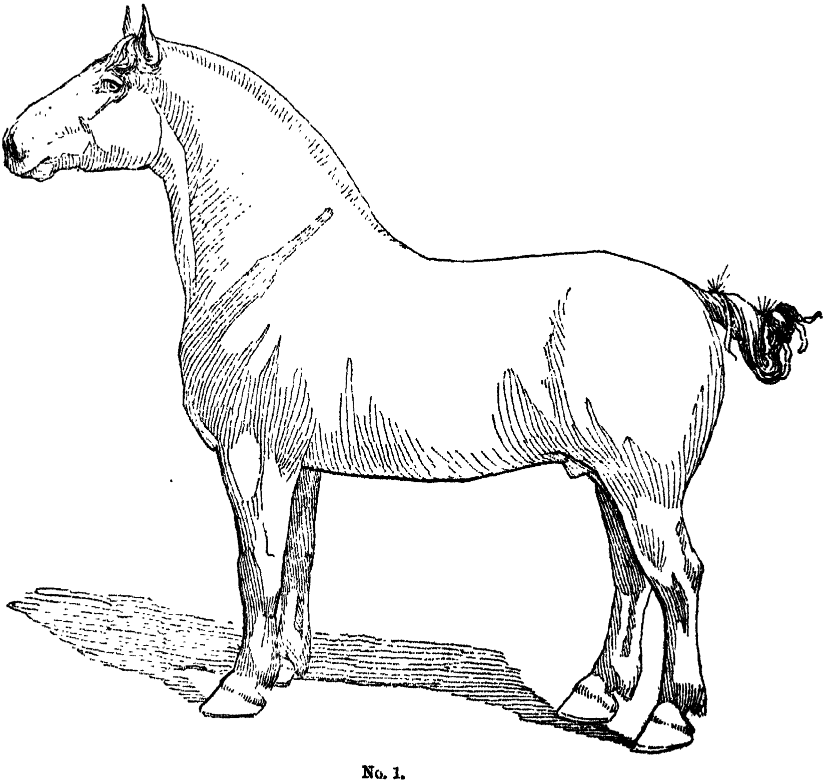
This, however, I do not think will occur if the drainage is efficient.

I have always been of opinion that some caution is required in using water from this and similar bores for irrigating, but that no danger to vegetation need be apprehended if the water is used sparingly, if the drainage is thorough, and if about 4 cwt. per acre of gypsum (sulphate of lime) be lightly ploughed in. As the deposition of alkali on the surface is due to surface evaporation, this must be prevented, by keeping the surface soil stirred as much as possible, and also by growing crops with deep roots, and with considerable leaf-surface to shade the surface soil.

Such crops as lucerne, fruit-trees, beet-root, &c., are found to do best on these soils; cereals, &c., being less likely to succeed.

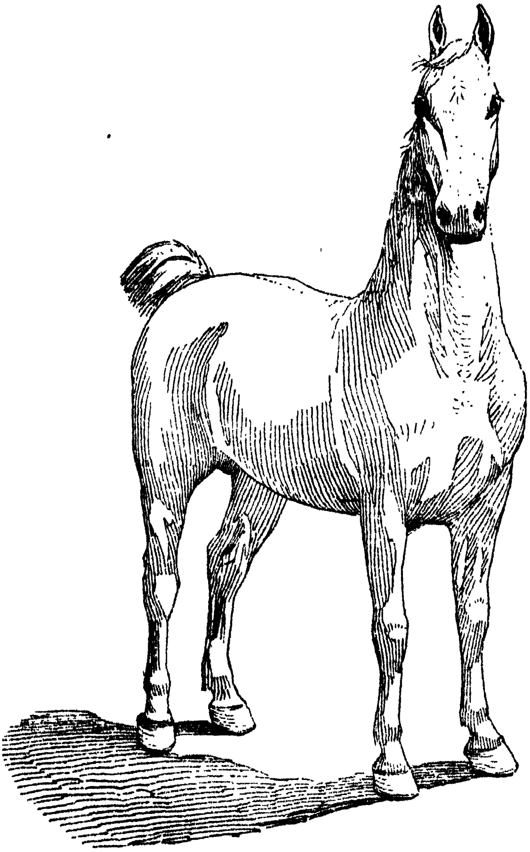
TYPES OF HORSES.

IN response to inquiries respecting types of Continental horses, the accompanying outline drawings have been made from the *American Agriculturist and American Cultivator.*



No. 1.

No, 1 represents a two-year old imported French Percheron stallion.



No. 2 is an illustration (somewhat exaggerated) of a French coaching stallion.

Efforts will be made to procure some reliable photographs of the different breeds of Austria, Russia, and South America, in order that they may be reproduced for purposes of comparison with our Colonial horses. If any of the readers of the *Gazette* interested in the subject should care to send photographs of New South Wales horses for reproduction a good purpose will be served. If possible, it would be most desirable to have views taken from the head or hindquarters, as well as profile.

As previously announced, the Hon. the Minister for Mines and Agriculture is desirous that no effort be spared to improve and maintain the quality of horses suitable for army purposes, and in accordance with his directions articles are now being prepared with the object of providing horse-breeders with full information as to the requirements of the Imperial authorities and the steps to be taken to meet them.

Replies to Correspondents.

Raising Orange-trees from Pips.

Mr. W. H. Hand, of Mount Pleasant, Penrith, asks for information as to the best method of raising orange-trees from pips. His idea is to establish a little nursery in connection with his citrus orchard from which to supply young trees to replace those that die off from *mal di goma* or any other cause.

The Fruit Expert, Mr. W. J. Allen, says :—The pips for growing orange stocks should be taken from seedling oranges, as they make the best and most vigorous trees. The pips may be allowed to remain in the oranges until the warm weather in spring, when they are taken out and planted in a bed prepared as follows :—If the land is not a nice sandy loam, cart in several loads of sand and mix it with the soil, to which add, if procurable, one bag of well-rotted sheep manure to every bed 4 feet wide by 8 feet long. Great care should be taken to get the manure, soil, and sand thoroughly mixed.

Plant the pips about 3 inches apart to a depth of three-quarters of an inch, after which mulch the top of the beds with well-rotted, dry, fine manure scattered over the top to a depth of a quarter of an inch. This should be watered with a fine rose-pot every other day unless the weather be very dry and hot, when it should receive a good sprinkling every day. The beds should be protected from the sun by using frames raised from 12 to 18 inches above the bed, and covered with hessian or light brush fastened to them, so that the beds are sheltered from the driest rays of the sun, which would possibly burn off the young plants as they show above ground. As the seedlings grow, the covers can gradually be discarded, until at length the plants are robust enough to require no further shelter. The latter part of September is a good time to plant the pips.

Preparing Virgin Land for Fruit-trees.

A Correspondent at Lindfield, who is about to plant out a few trees for domestic use, asks :—

1. How deep has the virgin ground to be broken up?
2. How long before you plant should it be prepared?
3. What manure (if any) should be given to each tree?

The Fruit Expert, Mr. W. J. Allen, reports :—(1) Wherever it is possible, it is always best to break the ground up to a depth of at least 15 inches—that is, loosening the subsoil, but not bringing it to the top. (2) It is always well to prepare the ground a few months before the planting season, so that it may have an opportunity of sweetening. This, however, is not absolutely necessary, but is always advisable.

When this cannot be done, the desired result may be achieved by applying lime at the rate of 1 ton per acre. This dressing is essential for nearly all the land about Lindfield. The lime loosens and sweetens the soil, and the trees will thrive from the start. (3) If horse or sheep manure is obtainable, it would be well to give each tree about four shovelfuls of sheep, or double that quantity of horse, manure. This should be worked into the ground about a foot away from the young tree after it has been planted, but should not on any account be allowed to come into direct contact with the roots, otherwise it might kill the tree. The best plan, unless there are facilities for thoroughly watering the tree from time to time, would be to put any manure on the surface. The rain will wash the good of manure into the ground for the benefit of the tree, and the remainder will serve as a mulch. It will probably be necessary to have the area devoted to fruit-trees drained. If the subsoil is sticky, and does not readily crumble when exposed to the air for a few days, draining will be essential.

Broom Millet.

"RICHMONDITE" asks for information concerning the cultivation and harvesting of broom millet in the Richmond River District.

Mr. H. V. Jackson, Manager of the Wollongbar Farm, has been asked to furnish a report as to the possibilities of the crop in that district, and his advice will appear next issue. Meanwhile, it may be mentioned that in the *Farmers and Fruit-growers' Guide*, published by the Department, there is an article dealing with the cultivation and handling of this crop in the drier portions of the Colony.

Drying Grapes.

A CORRESPONDENT inquires whether grapes can be dried as well with a patent fruit-dryer as in the open air. He points out that in his district showers are so frequent that it is difficult to rely on a spell of weather sufficiently dry to cure grapes without their getting wet.

The kind of dryer is not mentioned, but Mr. W. J. Allen, Fruit Expert, expresses the opinion that the curing of grapes in a dryer could not be carried on with anything like the results achieved in the open-air system. The operation would take a long time, and the fruit so dried would not have the finished quality of raisins cured in the ordinary way. In districts were climatic conditions are so unfavourable for drying, it would be wise not to attempt raisin-making on a commercial scale.

Varieties of Mandarins.

IN reply to inquiries from the Hawkesbury River, the Fruit Expert states that the Emperor mandarin has so far proved the most profitable variety. The Beauty of Glen Retreat is reported to have given satisfaction in a great many districts, and will, Mr. Allen thinks, supersede even the Emperor.

Earth-nuts or Pea-nuts.

Mr. C. Willings writes: "I am sending a specimen of pea-nuts grown at Wetherill Park according to instructions in the *Farmers and Fruit-growers' Guide*. They are quite a novelty to my neighbours. There are upwards of 150 pods on each plant's roots. I would be glad to know some simple and inexpensive way of roasting them."

The pea-nuts sold in the streets of Sydney are usually in a roasted condition. Some of the vendors purchase the raw "nuts" and cook them in an oven until the husk becomes very slightly browned and the "kernels" readily part with their skin. The writer has seen pea-nuts baked in an ordinary oven—a layer about an inch deep being laid on the shelf of the oven. Treated in this way they tasted first-rate. The demand for "Ro—o—oast p'nuts" is, however, scarcely of sufficient magnitude to be worth catering for. The two principal uses of the crop are, firstly, for the extraction of oil, and such oil is certainly the most versatile of products, since it can be used for lubricating, burning, or blending with other more expensive oils. It is reported that much of the so-called olive oil is derived from the pea-nut.

Secondly, as a crop into which when ripe pigs may be turned. They are fond of the "nuts," and root them out for themselves, devouring with great gusto and excellent results the husks and kernels.

A few can be fed to fowls, for which they ought to provide a useful change of feed.

Divi Divi Tree.

Mr. A. J. Logan of Hokianga, New Zealand, asks whether the Divi Divi tree could be profitably grown near Auckland.

The Government Botanist, Mr. J. H. Maiden, reports that this tree, *Cæsalpinia coriaria*, the pods of which are used for tanning purposes, is a native of tropical South America and the West Indies, where it is usually found in marshy places. It would not be worth attempting its cultivation in any but a tropical climate.

THE FARMERS AND FRUIT-GROWERS' GUIDE.

A fourth edition of this work is now ready. The greater portion has been re-written and brought up to date. Copies may be procured at the Government Printing Office, Sydney, or at any of the establishments mentioned on page i of the advertisements in this issue.

AGRICULTURAL SOCIETIES' SHOWS, 1900.

Society.	Secretary.	Date.
Dapto A. and H. Society	A. B. Chippindall	Jan., 10, 11
Thornleigh and District Horticultural Association	Fred. N. Brack	,, 13
Albion Park A. and H. Association	H. Fryer	,, 17, 18
Kiama Agricultural Association	James Somerville	,, 25, 26
Gosford A. and H. Association	W. McIntyre	,, 26, 27
Wollongong Agricultural Association	J. A. Beatson	,, 31, Feb., 1, 2
Agricultural and Horticultural Society, Shoalhaven	R. Leeming	,, 8, 9
Manning River (Taree) A. and H. Association	W. Plummer	,, 9, 10
Alstonville Agricultural Society	N. R. Elvery	,, 14, 15
Moruya A. and P. Society	John Jeffery	,, 14, 15
Lithgow Agricul., Horticul., and Produce Society	M. Asher	,, 15, 16
Ulladulla A. and H. Association	C. A. Cork	,, 21, 22
Tumut Agricultural and Pastoral Association	M. McNamara	,, 21, 22
Central Richmond River Agricultural Society	D. Cameron	,, 22, 23
Cobargo A., P., and H. Society	T. Kennelly	Mar. 1, 2
Robertson Agricultural Society	R. E. Ferguson	,, 1, 2
Berrigan A. and H. Society	R. Drummond	,, 7
Canowindra P., A., and H. Association	A. E. Smith	,, 7
Tenterfield I. P., A., and M. Society, Show	T. W. Hoskin	,, 6, 7, 8
,, ,, Fair days	,,	,, 9, 10
Candelo A. Association	C. H. Brooks	,, 7, 8
Campbelltown A., H., and I. Society	A. R. Payten	,, 7, 8
Walcha Pastoral and Agricultural Association	F. Townshend	,, 8, 9
Oberon A., H., and P. Association	Alf. Gale	,, 8, 9
Port Macquarie and Hastings District A. and H. Society	J. Y. Butler	,, 8, 9
Berrima District A., H., and I. Society (Moss Vale)	James Yeo	,, 8, 9, 1
Campbelltown A., H., and I. Society	A. R. Payten	,, 9, 10
Lismore A. and I. Society	T. W. Hewitt	,, 7, 8
Cudal A. and P. Society	C. Schramme	,, 14
Bega A., P., and H. Society	J. Underhill	,, 14, 15
Central New England (Glen Innes) P. and A. Assoc.	John Priest	,, 14, 15, 16
Nepean District A., H., and I. Society	E. K. Waldron	,, 14, 15, 16
Macleay (Kempsey) A., H., and I. Association	E. Weeks	,, 14, 15, 16
Goulburn A., P., and H. Society	J. J. Roberts	,, 15, 16
Cumnock P., A., and H. Association	W. L. Ross	,, 20, 21
Bombala Exhibition Society	R. H. Cook	,, 20, 21
Armidale and New England P., A., and H. Association	W. H. Allingham	,, 20, 21, 22
Mudgee Agricultural Society	J. M. Cox	,, 21, 22, 23
Inverell A. and P. Society	J. McGregor	,, 21, 22, 23
Camden A., H., and I. Society	C. A. Thompson	,, 21, 22, 23
Crookwell P. and A. Association	J. W. P. Levy	,, 22, 23
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28, 29
Clarence P. and A. Society (Grafton)	J. C. Wilcox	Mar. 28, 29
Blayney A. and P. Association	H. Woolley	,, 28, 29
Gundagai P., A., H., and I. Society	A. Elworthy	,, 29, 30
Lower Clarence (Maclean) Agricultural Society	Geo. Davis	April 3, 4
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 4, 5
Cooma P. and A. Association	C. J. Walmsley	,, 4, 5
Upper Hunter (Muswellbrook) P. and A. Association	J. C. Luscombe	*
Orange A. and P. Association	W. Tanner, junr.	April 4, 5, 6
Warialda P. and A. Association	W. B. Geddes	,, 4, 5
Royal Agricultural Society of New South Wales (Sydney)	F. Webster	,, 11-21
Rylstone H. and A. Society	W. Taylor	,, 25, 26
Bathurst A., H., and P. Association	W. G. Thompson	,, 25, 26, 27
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	,, 25, 26, 27
Wellington P. and A. Society	James Thompson	May 2, 3
Moree P. and A. Society	S. L. Cohen	,, 2, 3, 4

Society.	Secretary.	Date.
Upper Manning A. and H. Association, Wingham ...	Wm. Dimond ...	May 3, 4
Durham (Dungog) A. and H. Association	C. E. Grant ...	,, 9, 10
Richmond River A., H., and P. Society (Casino) ...	Jas. T. Tandy ...	,, 10, 11
Hawkesbury District A. Association (Richmond) ...	C. S. Guest ...	,, 10, 11, 12
Gunnedah P., A., and H. Association	J. H. King ...	,, 15, 16, 17
Nyngan A. and P. Society...	J. C. Cahill ...	,, 16, 17
Coonamble P. and A. Association	F. C. Lamotte ...	,, 23, 24
Deniliquin P. and A. Society	H. J. Wooldridge	July 19, 20†
Riverina P. and A. Association (Jerilderie)	Wm. Elliott ...	,, 24, 25
Hay P. and A. Society	G. S. Camden ...	,, 25, 26
Condobolin P and A. Association...	D. H. Tasker ...	,, 25, 26
Balranald P. and A. Society	— Murray ...	Aug. 1
Forbes P. A. and H. Association	N. A. Read ...	,, 1, 2
Parkes P. and A. Association	G. W. Seaborn ...	,, 8, 9
Lachlan Pastoral and Agricultural Association (Hillston)	Thos. Cadell ...	,, 10
Corowa P. A. and H. Society	E. L. Archer ...	,, 14, 15
Cootamundra A., P., H., and I. Association	Thos. Williams...	,, 28, 29, 30
Northern Agricultural Association, Singleton	Ch. Poppenhagen	,, 29, 30, 31
Murrumbidgee P. and A. Association (Wagga Wagga)...	R. E. Shorter ...	Sept. 5, 6
Grenfell P., A., and H. Association	Geo. Cousins ..	,, 5, 6
Manildra P. and A. Association	G. W. Griffith ...	,, 5
Albury and Border P., A., and H. Society	Geo. E. Mackay..	,, 12, 13
Burrangong P. and A. Association (Young)	Geo. Ward ...	,, 12, 13
Yass P. and A. Association	F. C. Mackintosh	,, 13, 14
Moama A. and P. Association	C. L. Blair ...	,, 19
Cowra P., A., and H. Association...	H. Smith ..	,, 19, 20
Junee P., A., and I. Association	T. C. Humphrys..	,, 19, 20
Burrowa P., A., and H. Association	Fred. H. Trout...	,, 21, 22
Millthorpe Agricultural Association	S. C. Francis ...	,, 25, 26§
Temora P., A., H., and I. Association	W. H. Tubman...	,, 26, 27
Germanton P. A. and H. Society	G. T. S. Wilson	,, 26, 27

1901.

Dapto A. and H. Society	A. B. Chippindall	Jan. 9, 10
Berry Agricultural Society...	A. J. Colley ...	,, 22, 23, 24
Wollongong A. and I. Association	J. A. Beatson ...	Jan. 31, Feb. 1, 2
Kiama A. Association	Jas. Somerville ...	,, 26, 28
Alstonville Agricultural Society	Henry R. Elvery	Feb. 26, 27
Tenterfield Intercolonial, P., A., and M. Society ...	F. W. Hoskin ...	Mar. 5, 6, 7‡
Berrima District A., H., and I Society (Moss Vale) ...	Jas. Yeo.. ...	,, 7, 8, 9
Central New England (Glen Innes) P. and A. Assoc. ...	Geo. A. Priest ...	,, 12, 13, 14
Crookwell P. and A. Association	M. P. Levy ...	,, 21, 22
Upper Hunter P. and A. Association (Muswellbrook)...	J. C. Luscombe...	,, 27, 28, 29
Hunter River A. and H. Association (West Maitland)...	W. C. Quinton ...	Apr. 17, 18, 19

* Show postponed till 1901. † Sheep Dog Trial, 23 May. ‡ Fair Days, March 8, 9.
§ Show and Intercolonial Champion Ploughing.

[10 plates.]

Sydney: William Applegate Gullick, Government Printer.—1900.

No. 1.—Horses in Yards for Inspection.

No. 2.—A Heavy Cavalry Re-mount.

Vol. XI. Part 8. *AUGUST.*

The Qualifications of Military Remounts.

J. D. STEWART, M.R.C.V.S.
Government Veterinary Surgeon.

Being at Wallangarra when some 400 head of horses were submitted to Major Thompson and Captain Nuthall, who were buying on behalf of the Imperial War authorities, I had an opportunity of collecting the following information which might prove of interest to owners and breeders of horses. Some remarks on breeding remounts are made, and a few photographs showing the various stamps of horses purchased are attached.

Apart from the number of horses that have been exported for the Indian market and those which have been despatched to the seat of war with the various Colonial Contingents, some 8,000 have been shipped for South Africa by Messrs. Houlder Bros., acting as agents for the Imperial authorities, since hostilities commenced in that country, the last shipment being that of the "Rippingham Grange," which took away 1,085 head.

The horses purchased at Wallangarra were, on the whole, fair specimens of the average horse as bred in the Colonies. Some were a little above the average stamp, others were below, as might be expected when such a large number are purchased at the one time.

In the selection of horses offered for sale, particular attention is paid to their colour, age, soundness, conformation, and action, and I propose dealing with these characteristics separately, so that a better idea of the qualifications of a remount may be more widely known.

Colour.

The most acceptable colours for remounts are bay, black, brown, and dark chestnut. Still a good roan is readily purchased.

There is no demand for horses of light colours, owing to their being conspicuous, and thus forming good targets for the sharpshooters of the enemy. Under this category fall white, creamy, dun, piebald, and skewbald horses. Even light chestnuts with considerable white are not liked.

The ages for horses for active service are strictly limited to between five and ten years inclusive.

Soundness.

Prior to purchase, every horse is submitted to veterinary examination. Needless to state, unsound horses are speedily casted. Chief among the causes of unsoundness are defective vision, malformed mouths, lameness, pole-evil, fistulous withers, broken knees, splints in certain positions where they are likely to interfere with the horse's action, ringbone, sidebone, diseased feet, spavin, curb, stringhalt, and any serious interference with respiration. A blemish that does not materially interfere with the animal's usefulness is not considered a detriment. It is worthy of note that not 2 per cent. of the horses submitted at Wallangarra were casted as being unsound.

Action.

Good clean action is indispensable for army horses. Heavy horses were walked, trotted, and backed, while light horses were tested at the trot, canter, and gallop.

Conformation.

This must necessarily depend on the class the horse submitted belongs to, as, for instance, Light Cavalry or Field Artillery. Still, in a general way, it might be stated that the desired conformation consists in the horse possessing an intelligent head, set on a well-formed neck, attached to a well ribbed-up body of good girth and fair width of chest, supported by muscular limbs carrying good bone and hoof. According to the horse's conformation, together with his height and weight, he is graded to one of the following classes or divisions, particulars of which Major Thompson kindly supplied me with, viz.:—

Heavy Cavalry.—Upstanding horses of good bone and substance, and with exceptionally strong back and loins. They must be from 15·2 to 15·3 high, and be able to carry 17 stone.

Light Cavalry.—Horses similar to the above, but lighter in conformation, yet up to 15 stone. Height, 15 to 15·2.

Mounted Infantry Cobs.—Stout active cobs, with strong back and loins, and powerful shoulders and hind-quarters. They must measure 8 inches below the knee, and be up to 14 stone. Height, about 14·2.

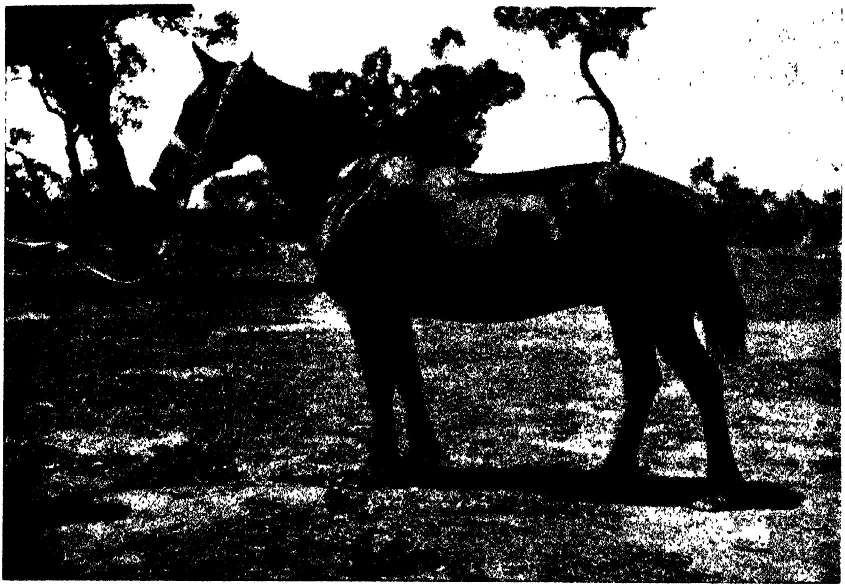
Horse Artillery.—Horses somewhat similar to the heavy cavalry horse, but in conformation more suitable for harness work. They must be equal to any pace. Height, 15·2 to 15·3.

Field Artillery.—Active draught horses equal to trotting 6 miles an hour in team, drawing one ton, and maintaining that pace. They must have weight and substance, good colour, deep chests, short legs showing plenty of bone, and good feet. Height, 15·2 to 15·3.

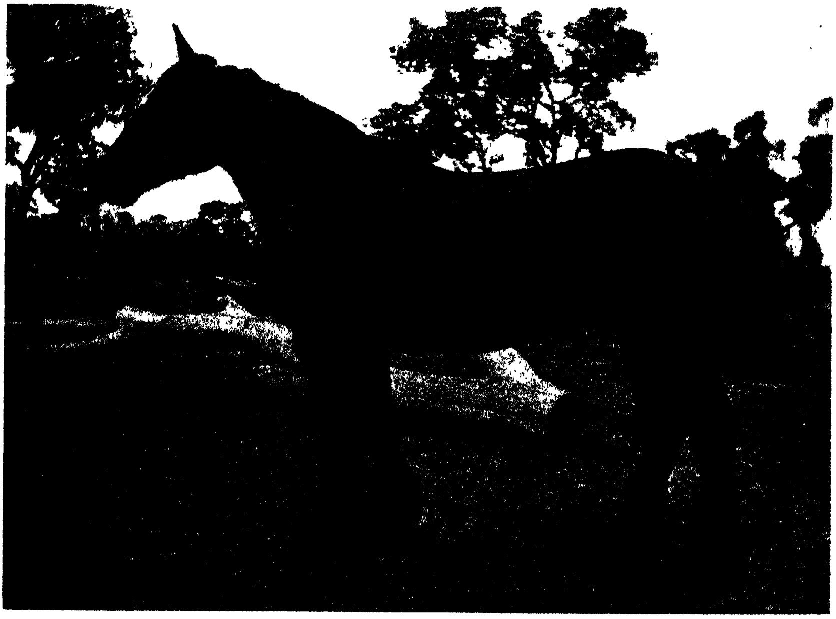
Army Service Corps.—Active heavy draught horses about 15·3 high. Occasionally useful horses a trifle higher are taken under this class for special heavy draught work at the port of disembarkation.

No. 3. A Light Cavalry Re-mount.

No. 4.—A Hussar's Charger.



No. 5.—A Light Artillery Horse.



No. 6.—A Royal Field Artillery Horse.

Remarks.

Although very few horses were casted as unsound, a fair number were rejected as being unsuitable as regards conformation. The experts never hesitated to reject "weedy," badly ribbed-up horses, or horses whose lightness of bone gave them the appearance of being "tied in" below the knee. Their action in this respect is to be fully endorsed, as it is one which should have a good effect on horse-breeding in the future.

The prices paid for suitable horses were sufficiently remunerative to encourage the more general breeding of animals of the right stamp. No doubt if the average stamp of horse were improved prices would advance accordingly, and breeding would become a lucrative business. A conclusion which forces itself on the mind of every one who has inspected a large number of the remounts recently purchased is that there is no market for the half thoroughbred "*weed*." This statement is not made with any intention of disparaging the thoroughbred, an animal which commands my full respect, as I believe an ounce of blood is well worth a pound of flesh at the end of a long day's journey, but to point out the fallacy of breeding horses by ill-shaped thoroughbreds, out of mares of doubtful origin and objectionable conformation. Often the only recommendation the sire has is a thoroughbred pedigree, and the fact that he has "won a race." The result of such a cross is usually a "weed" that can gallop a furlong or so, and is of but little use for anything else. The sale of such an animal is not calculated to go far towards paying for the services of the sire, the keep of the mare, and rearing of the progeny. As is well known, a few years back the farmers who kept a few good draught mares could almost clear the rent of the farm by the sale of their young horses, while those that bred good light horses made profitable investments. Certainly the prices that horses brought at that time were fairly high. But although they have been going cheap for the past five years or so, there is every indication of their once more attaining a better value. It must, however, be remembered that when the prices went down the standard of the horses bred correspondingly lowered. A good horse always commanded a good price; and I believe he always will. Moreover, from a breeder's point of view, it is as easy to rear and feed a good horse as a bad one. With a view of commanding a profitable market for the light and medium-sized horses at home and abroad, the adoption of the following crosses is suggested for the consideration of breeders:—

1. The Suffolk Punch and thoroughbred mare.
2. Hackney stallion and thoroughbred mare.
3. Cleveland Bay and thoroughbred mare.
4. Thoroughbred stallion with mares of above crosses.

The adoption of a tax on stallions has been frequently advocated as a means of improving our horses, and if it could be put into operation no doubt it would have a good effect. In its absence, I believe the establishment of a Government stud would offer as equally good an incentive to the more extensive breeding of remount horses.

At Wallangarra I took several photographs of the different stamps of horses purchased, of which the attached prints will perhaps convey a fair idea of the various classes:—

1. A mob of over 200 in the yards waiting inspection. It will be seen that the horses are a fairly even lot.
2. Pictures a heavy cavalry horse, which is not exactly a typical example, as a little more substance is required. Horses of his class bring £18, off grass.

3 and 4. Are light cavalry horses. No 4 stands 15·2, and measures as follows:—*i.e.*, girth, 7 feet 2 inches; forearm, 20¼ inches; below knee, 8 inches. Value, £15 to £18.

5 and 6. Field-artillery horses. No. 6 is a brown gelding, aged, 15·3 high; girth, 7 feet 6 inches; forearm, 21 inches; below knee, 8 inches. Value, £15 to £18.

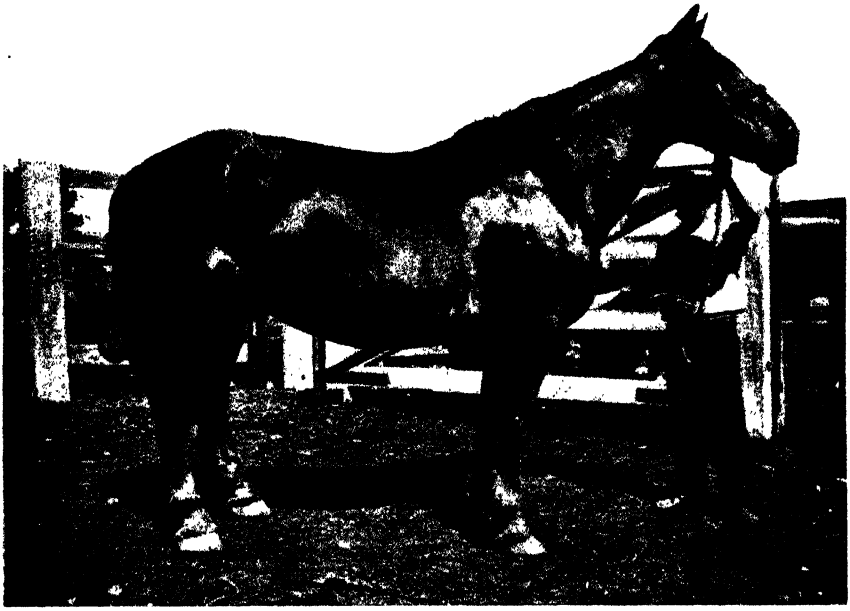
7. Brown gelding, suitable for the army service corps. Height, 15·3; girth, 7 feet 8½ inches; forearm, 23 inches; below knee, 9 inches. Value on farm, £20.
8. A mounted infantry cob, 5 years old, 14·2 high; girth, 6 feet 11 inches; forearm, 18½ inches; below knee, 8 inches. Value, £12.
9. A team of gunners, the property of Mr. John Meloy, and bred by Mr. H. F. Smith, of Kyogle. This team was awarded first prize, offered by the Department of Agriculture, at the Royal Agricultural Society's Show of 1900.

FRUIT PESTS AND THEIR TREATMENT.

MR. W. LAWLOR, of Sunnyside, Tenterfield, writes:—"I have read with interest your article on peach-leaf curl, in the last issue of the *Gazette*. I send you a cutting from the *San Francisco Weekly Examiner* relative to same, which is worth trying if you think it worth making public. It has the merit of being simple, and cannot do harm. I intend trying it myself this season:

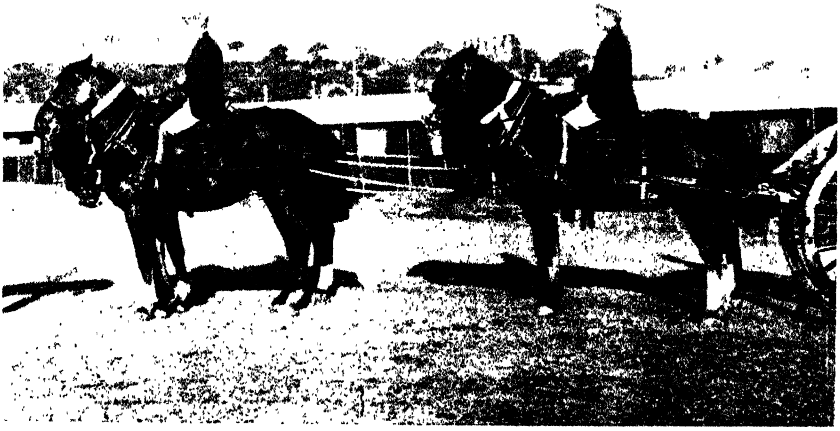
> I have been reading for several years communications from different writers on curly leaf in peach orchards, and cures for it. Now, as my opinions differ from any I have read, and I have ample proof that I am right, in as few words as possible I will tell the cause of curly leaf and offer a sure cure for the worst case. In the first place, no one ever saw curly leaf in a dry season on dry soil. That is proof enough that curly leaf is caused by too much water at the time the sap begins to flow. To cure the worst case of curly leaf, cut out a narrow strip of bark, a quarter or half an inch wide, from the ground up to the first limbs, in two or three places, and so get rid of the extra amount of sap. It will cost nothing but a little labour; the scars will grow up in a short time. I have tried the above remedy for several years, and have never failed to cure the worst case. This is going to be a bad year for this trouble, in the northern part of California any way, as we have had an unusual amount of rain. I hope some will try this, as I know it will cure. There will be an improvement in a very short time. The leaves will straighten out (except in the worst cases, when a good many leaves will fall), and the fruit mature.—ISAAC M. SPEEGLE, Chico, Butte County, Cal.

"I may also state that a couple of years ago I saw in the same paper another simple remedy for pear mite, which I have proved effective; it is this: With a good, sharp-pointed knife make a cut from the ground upward to where the branches spread out, or above it (it will not hurt), three or four places around the tree, but not so deep as to cut into the wood. It cured my trees, which were very bad."



No. 7.—Army Service Corps.

No. 8.—Mounted Infantry Cob.



No. 9. Team of 1st Prize Gunners at the Royal Agricultural Society's Show, 1900. Bred by Mr. H. F. Smith, Kyogle.

TYPES OF HORSES PURCHASED FOR MILITARY PURPOSES.

Pleuro-Pneumonia in Dairy Herds.

M. A. O'CALLAGHAN.

PLEURO-pneumonia has been characterised by the chief veterinary officer of the English Board of Agriculture as "an infectious disease of the lung of the ox, primarily infecting the internal structures, and extending, but not always, to the pleural or outer cover. It is sometimes acute and sometimes chronic in its progress."

As reports have reached me from dairying centres, especially on the South Coast, that this disease has broken out in some of our herds, I do not think I can do better than call attention to some of the points in connection with the disease which have been definitely ascertained.

The cause of pleuro-pneumonia has not been definitely determined, although it is generally admitted that it is one of the diseases caused by a micro-organism. A great deal of work has been done in connection with this disease by European bacteriologists, but so far no organism has been isolated capable of producing the same lesions as are found in animals suffering from this disease. Many causes have been given why the organism which causes the disease has not been discovered, and perhaps one of the most likely is that stated by Nocard, viz., that the micro-organism might be so small that our present microscopes are not sufficiently powerful to distinguish it. Professor Arloing, of the veterinary school, Lyons, at one time made the announcement that he had discovered the organism which causes the disease, and which he termed "Bacillus pneumo liquefaciens bovis," but the organism was not capable of producing the disease as we know it.

People accustomed to cattle-stations in Australia are more familiar with the disease than perhaps the people of any other part of the British Dominions, and a great deal of field knowledge regarding the disease is possessed by many of our station managers. There are, however, some points which they never seemed to have inquired into; perhaps this is because they regard inoculation as a preventive for the disease, and hence no longer look upon it with the fear that British stockowners do. This disease cost England an enormous amount of money, as whenever an animal was found to be infected all the other animals in the herd, or any animal with which this beast had come in contact for some weeks previous, were condemned to immediate slaughter, for which the State paid. In this way the disease which was brought from the Netherlands to England in 1840, and which ravaged the herds of England for several years afterwards, has now been reduced to such a state that in 1896 only two outbreaks were discovered, and in 1897 only 7.

On 1st September, 1890, the Animals Contagious Diseases Act came into force in the United Kingdom, and in that year 11,301 healthy cattle which had been in contact with diseased ones were slaughtered, in addition to 2,004 diseased cattle which were killed and 55 which had died. The following year 9,491 healthy cattle which had been in contact were slaughtered and 778 diseased ones. This will give readers an idea of the drastic measures taken by the British Government for the suppression of the disease, and what it must have cost England to stamp it out, for it ran its course successfully for about fifty years among British herds. The result of the stamping-out system adopted by that Government is best shown by the fact that in 1895, only five years after the Animals Contagious Diseases Act came into force, but one diseased beast was killed, together with 43 contacts, which proved to be healthy, but many of which latter no doubt would have contracted the disease had time been given for it to develop.

What the stamping-out system did for England the system of inoculation with what is called "pleuro-virus" partly did for Australia, and now although on northern stations there are generally a couple of pleuro cases to be met with, still the disease never spreads to the general herd, and this is no doubt attributable to the results of preventive inoculation.

As the result of work done and experiments made, the English Board of Agriculture has laid down as follows :—

1. Pleuro-pneumonia is a disease which cannot be communicated to animals other than those of the bovine race.
2. It has never been produced in an animal even of the same class by what is termed "mediate contagion."
3. The infected germs appear to be transmitted only by the breath of the living diseased beast, and their power to infect ceases with the death of the diseased animal.

In England various attempts were made when the disease was at its height, and when investigation was being carried out, to infect healthy cattle through the medium of offal, manure, and even the lungs of the diseased animals, the lungs being removed from the diseased beasts immediately after death, and placed in a manger of healthy animals, and without communicating the disease. Healthy animals were also inoculated with the fluid taken from the lungs of advanced cases, and even in this way the disease has not been communicated. I might point out that the system of preventive inoculation, which is carried out in this country, was used in the cowsheds of London and Edinburgh for many years as a preventive, but evidently the English Department of Agriculture were not satisfied with results, and determined at any cost to stamp out the disease, hence the question of compulsory slaughter of all diseased animals and contacts.

In this matter of contacts, pleuro-pneumonia holds a peculiar position with regard to diseases of animals, because most of the other European diseases, as foot and mouth disease, glanders, &c., can be communicated by cohabitation, but it appears that the only means by which pleuro-pneumonia can be transmitted is the inhalation by a healthy animal of the breath of a diseased animal. Therefore animals cannot get the disease from grazing in paddocks where diseased beasts had previously been. Neither can they get the disease from affected animals situated at any distance. There must be immediate contact in order to cause infection. The disease can be communicated from one farm to another across our Australian post-and-rail fences, even without the animals having any further recourse to one another. The disease can in this way go from herd to herd, as it is a common thing for animals on different sides of a boundary-fence to lick one another. As long then as farmers keep their cattle from contact with the animals of their neighbour, even though the cattle of the latter may be suffering from pleuro-pneumonia, the former will be quite safe. The disease, however, is a very insidious one, and our herd may be attacked for weeks before we are made aware by results that the disease is present. This is due to the fact that the period of incubation of the disease is of very wide limit, ranging from a couple of weeks to several months.

About two years ago I was lucky enough to be the means of saving some valuable stud animals by instructing the man in charge to take the precautionary measure of recording the temperature of suspected animals every day. The disease had got into a section of the herd, and fears were entertained for the stud animals. I directed that the temperature of the stud bulls should be taken at once, and that this should be repeated daily until the disease had disappeared from the herd. The result was that on the first set of temperatures being taken a beautiful young bull showed rather high, but as he ate his feed as usual and looked perfectly healthy, the owner wrote to me to say he thought all was right. Acting on my instructions, however, he isolated the animal, and continued taking the temperatures daily. At the end of about ten days the temperature of the animal went up to 105°, and a week afterwards it died of acute pleuro-pneumonia. The isolation of this animal meant the saving of the others. Now, I have only to repeat the same advice to those dairy-farmers living in the districts where the disease is present. Get somebody who knows how to use a clinical thermometer to take the temperature of your cows and your bulls, and if none of them record above 103° you are quite safe. However, it will be wise to repeat the taking of temperatures a week later, and determine if the disease has made its appearance. Then, any animal showing a high temperature (104° to 106) should be separated from the herd immediately, and developments watched. When the disease was rampant in England it was made compulsory for every cow-keeper to record the temperatures of the animals every morning, and send same to the Office of the Board of Agriculture, London.

As previously stated, pleuro-pneumonia assumes two forms, viz., the acute and the chronic. Sometimes animals affected in the latter manner linger for months, and are all this time a source of infection. Some of the animals get cured; but my advice to a stockowner who has any of his beasts affected with pleuro-pneumonia is to destroy them at once, because, should a couple recover, they remain unsuspectingly (as I have stated) a source of infection, and would do more injury than they themselves are worth.

The following are some of the symptoms that have been noted by the English Board of Agriculture. As already stated, the disease is always accompanied by fever, and when it has developed, the temperature of the animal, instead of ranging from 101° to 102° 5′, or 103°, will have risen to 104° or over, and this, accompanied with other symptoms, it may be at once laid down as a certainty that the animal has pleuro-pneumonia.

The Chief Veterinary Officer of the English Board of Agriculture states: "Where contagious pleuro-pneumonia attacks the animal in acute form, all the symptoms commonly attendant upon lung affections become manifest; but if the disease assumes the mild or chronic form, in which only a small portion of lung is involved, it is by no means uncommon for the animal to pass through the disease without exhibiting any marked evidence of lung mischief. When an outbreak occurs, the first indication of its presence generally noticeable among milking cattle is the cessation of the secretion of milk. At this stage the appetite will be found to have fallen off, the animal will be found to cough more frequently than usual, the bowels are constipated, and rumination has been suspended. Fever will have set in, and the presence of the fever may be regarded as evidence that exudation and consolidation have already taken place in the structure of the lungs, or that the pleural covering has become affected."

The officer above referred to further states: "In acute cases, the evidence of lung mischief quickly increases, the breathing becomes more frequent, the pulse more rapid, and if the animal is driven or excited, violent coughing is produced. There is a great disinclination on the part of the animal to turn round in a stall, an act which generally brings forth a grunting sound from the chest."

"Auscultation," he states, "cannot be relied upon on account of the thickness of the walls of the chest, and also because the portion of the lungs involved may be situate in the anterior portion of the chest above the sternum or breast-bone, or beneath the large bones or muscles of the shoulder, through which the normal respiratory murmur cannot be heard. Pressure along the sides of the vertebræ immediately behind the withers, and in the spaces between the ribs, will cause the animal to crouch or flinch. As the disease progresses, the cough becomes constant and painful. This is indicated by a moaning or grunting sound which follows each inspiration. As the fever increases, the muzzle becomes hot and dry, the ears droop, and the temperature may rise to 107°; in the last stages the appetite ceases, and gradually becoming weaker, the animal falls down and lies in a recumbent position, grunting and constantly coughing, and with the head stretched out, the tongue protruding from the mouth and a painful, anxious look; it finally dies from suffocation."

Preventive Inoculation.

Australia has relied mainly on inoculation as a means of overcoming this disease, and, in the present light of bacteriological knowledge regarding many diseases, it seems that they have adopted a very good course, because it is only a very rich country like England that can afford to adopt a stamping-out system and a thorough one. Those who are accustomed to inoculate cattle against pleuro can do many hundreds in a day, and special crushes are always provided for same on all large cattle stations.

The question of suitable virus is the only one that any difficulty will be experienced in, as the inoculation itself is so simple that any person seeing it once done will have no difficulty in performing it himself. It simply means that short threads of soft cotton are soaked in the virus, and by means of a special needle, which can be purchased, these are drawn under the skin at the very end of the tail and allowed to remain there, in this way introducing the virus into the system in the part of the animal in which there is least likelihood of danger occurring from inflammation. The needle and all in connection with the inoculation should be kept as clean as possible, and, strictly speaking, if inflammation is to be avoided, sterile precautions should be adopted.

The tails of a great many cattle are lost through introducing micro-organisms that set up inflammation, and sometimes the beasts themselves are lost.

As regards the virus or lymph,—this is an exudation from the lungs during the process of the disease and collects in the cavity of the chest. It is best obtained from beasts affected with chronic pleuro-pneumonia, because then the lungs gradually waste away, and after a time scarcely anything is left but this straw-coloured fluid, which is commonly called "pleuro virus." This should be collected as cleanly as possible and in a clear, open atmosphere, because if the organisms to which abscesses and inflammation of various kinds are due gain access to the fluid, there is certain to be trouble and loss of many tails.

It would be well if this virus could be sent out when required from a central station or laboratory, having been previously examined to make sure that no tubercle bacilli (the organisms which cause tuberculosis) are present, because many are of opinion (and there is no doubt but there was plenty of opportunity for the circumstances to occur) that the general inoculation of cattle in Australia for pleuro-pneumonia with virus which had not been previously examined for tubercle bacilli, was a means of introducing tuberculosis into many of our cattle.

The Queensland Stock Department distributes virus specially examined and put up, and at the present time this is about the best place for our dairy farmers to get virus. Large stations with plenty of cattle, and plenty of experience in the disease, especially on the Queensland border, are well able to look after themselves in this matter of virus. In Queensland the disease is much more frequent than here; hence it is always an easy thing to procure suitable virus.

Cultivation and Irrigation in the Western District.

CLARENCE H. GORMAN.

Under the above heading my remarks in the main apply to Bourke and district, more commonly referred to as the "out back regions of the Colony." So far as irrigation is concerned, artesian wells have been the chief means of supply; only in a few instances do I know of any extensive operations being carried on by means of pumping from rivers or tanks. Results have been uneven, but in the majority of cases a fair return has been obtained. There are many who will say that irrigation by means of artesian wells has proved a failure; but there are many and various reasons to be attached to failure. The natural conditions in some cases have proved to be unfavourable, and there is no question but that the continued bad seasons have militated against success. The question is then asked, "Why in face of practising irrigation, is help from the seasons expected?" To the uninitiated this may appear a fair question, but those who have worked under irrigation know well that the results in a bad season of local conditions are not to be compared with those obtained in a fair season: in other words, assistance is expected in order to bring out the best possible results, otherwise only fair results are attained. It will be found that some artesian water is unfit for cultivation, and in one or two cases I believe it has been found to be unfit even for consumption. That would, however, only be in a few isolated cases. The first point of determination as to whether cultivation can be carried on or not must be by an analysis of the water; one can ascertain then if the water will aid or prevent operations. Then will come the question of cost in laying out, the main essential being the lay of the land and its quality. The country in and around Bourke district is so suited to irrigation in its evenness, that one has not to go to any very great expense to prepare the selected site. Holes to fill in and hillocks to level will comprise nearly all the preparatory work, and this can soon be attended to by the use of three or four strong horses, and that handy implement known as a "buckscraper" (an illustration of which appeared in a recent copy of the *Agricultural Gazette* under an article by Mr. W. J. Allen.) Levelling and preparing the ground is really the most important work. If it is not attended to properly in the first instance, trouble will always be arising. Once the land is so graded that the water can be applied quickly and economically, the work of irrigation becomes a pleasant task. One will find here that crops—permanent and otherwise,—fruit-trees and vines are planted without a thought as to the quickest and best way of applying the water; consequently grading has to be done later on, almost weekly. Owing to all this part of the country where water is available being naturally so level, one can find out the lay of the land by allowing the water to run on and around the portion to be cultivated; if, however, instruments are available, and can be used, levels should be taken, thoroughly and carefully, in the first instance. Ploughing must be commenced before grading, so as to leave the ground free for working the buckscraper. After levelling, the land should be cross ploughed, as no doubt there will be bare and hard patches whence the soil has been removed. The forming of head drains (otherwise permanent distributing ditches) should follow levelling. These should be made, if possible, along the highest portion of the area to be irrigated, unless a very large area is being worked, and then it may be found that four or five head drains are required. The levels taken, however, will determine this. The principal object of irrigation at Bourke up to the present has been the production of fodder crops, and supply for domestic and garden use. Cereals, lucerne, sorghum, rape, and, in fact, nearly all fodder crops give fair results. Some growers irrigate by means of flooding; others prefer furrowing out the land at given distances and allowing the water to soak through from furrow to furrow. It may be said that both methods are good, and it will depend on the class of soil to know which to follow. The soil locally known as "black," gives better results from flooding than from the use of furrows; whereas the red soil gives better results from the use of furrows. In the case of lucerne, however, flooding is suitable to either soils after the seed has germinated and the young plants are well above ground. With aid from the seasons, results would prove as good in this district as any other, but without aid we must only hope for fair returns. (The rainfall for the past three years has been—1897, 1,686 points; 1898, 795 points, and 1899, 998 points.) When a good supply of water is available, more attention and thought should be directed to the subject of green manuring, the benefits of which are apparent. Continual working of the soil, without a return of the good taken out, must result eventually in poor crops; then either irrigation is blamed or farming is spoken of as a failure. People to whom I have mentioned this subject remark that in their cases it is a matter of no consequence, because they only cultivate 30 or 40 acres "just for their own use"; but it is a matter of consequence to all who go in for working the soil. How often one sees flower gardens, &c., treated with tons and tons of manure, while no thought is given to the cultivation area which saves so many pounds by the fodder produced. I do not mean to say that one can treat 30 or 40 acres in a similar manner to a kitchen garden, but the larger area should be fostered just as much proportionately.

Many are under the impression that, in having water available for irrigation purposes, the production itself amounts only to sowing or planting, as the case may be, and waiting for results. Constant attention is necessary; the water is only one factor in the successful production of crops. The head must be used as well as the hands. Nevertheless the water should be ready when required. I have often been asked how much water will be necessary to irrigate an acre of land. This is a question that cannot be directly answered. First of all, one has to take into consideration the condition of the country, whether the land has been worked or irrigated before, the class of soil and the lay of the land. Different seasons, too, will regulate the quantity of water per acre. The system of irrigation, and the crops or trees worked, will also determine the quantity. Just here it will not be out of place to quote a well known authority on the duty of water. He says: "What amount of water will serve for any specified area of ground depends so completely upon the character of the soil and subsoil, the percentage of atmospheric humidity, the crop to be grown, etc., that no general rule can be given. It may be stated, however, that the extreme service claimed for water is from 8 to 10 acres of trees or vines, and 5 to 6 acres of small fruits per 'miner's inch,'—meaning the amount of 1 inch running constantly, but to be handled in multiplied inches, applied at intervals. The generally accepted inch of water is that which is equal to 17,000 gallons of water every twenty-four hours."

(*To be continued.*)

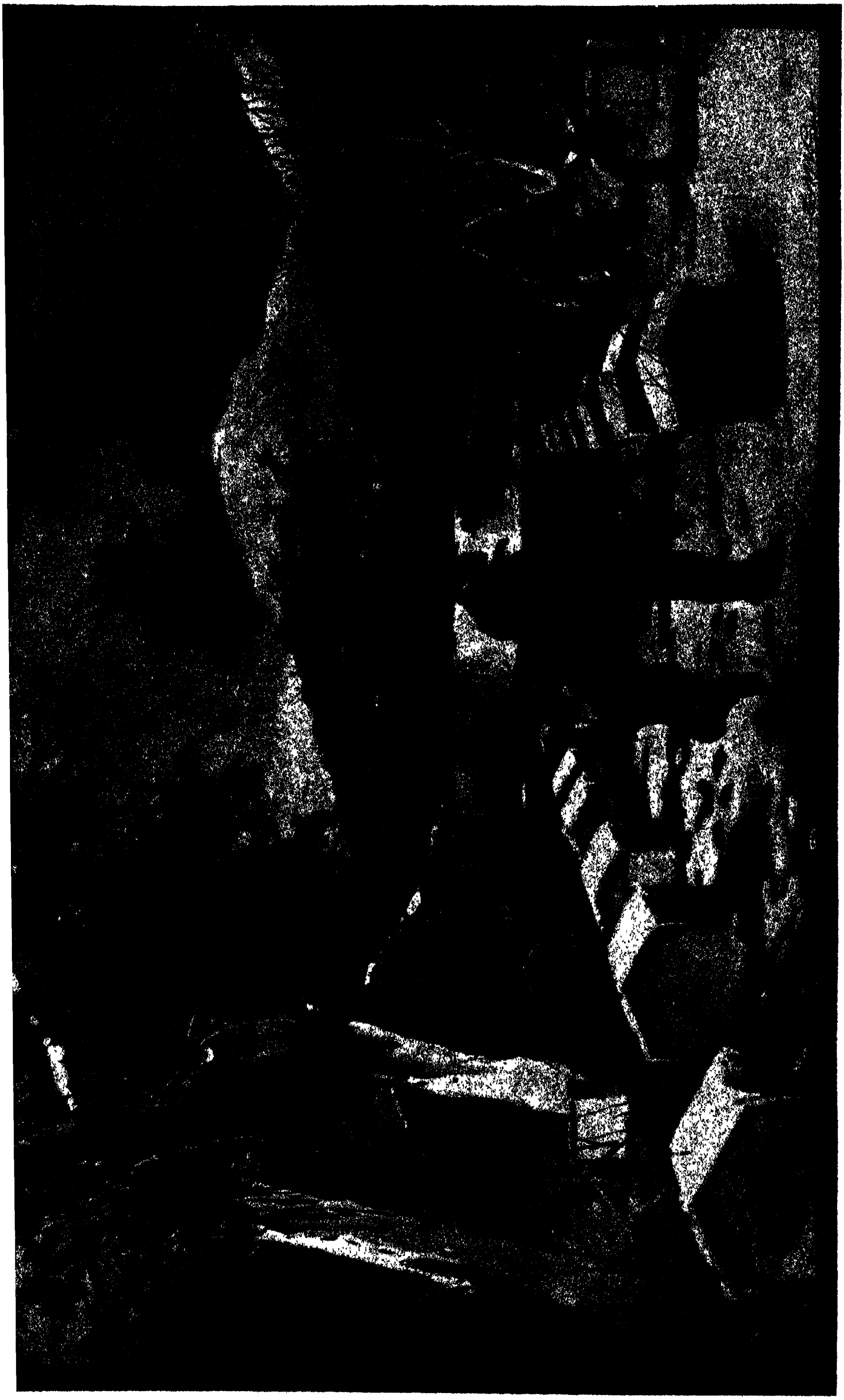
EDIBLE MAIZE.

LAST season, in some Sydney fruit shops, a few cobs of sweet corn were displayed as a sort of curiosity. It is simply marvellous when we consider how easily nearly all the varieties of maize for the table and popping can be grown in this colony, that large supplies are not made available for townspeople, who would acquire a taste for this wholesome and nutritious food, and soon make a point of buying it as readily as any other article of diet. If any-one desired to pop some corn this winter, where could they get it? And in the summer time, when the town appetite becomes coy, and might be tempted by a dish of corn dressed in some of the ways described by Dr. Cobb in this *Gazette* some years ago, where can the cobs be with certainty procured?

It would seem to be really worth while for some of our farmers to make a specialty of little side crops like table maize and popcorn. The popular taste would soon overtake supplies, and the grower would be able to turn in a nice round sum annually. Seed of all the best varieties can be obtained at the Sydney seed warehouses.

Sowing can be continued from about the end of September, or earlier (according to kind of season), until late in the summer. The soil should be well prepared and made rich and warm with plenty of well-rotted stable manure and good drainage. In gardens, the sunniest situation should be chosen, and a watchful eye kept open for cut-worms and caterpillars that nip off the heart shoots when the plants are a foot or so high, and get into the cobs when the grain is formed.

The usual method of planting is to have the rows about 3 feet apart, and the plants in the row from 8 inches to a foot apart."



A N.S.W. Bee-farm in Winter.

Bee-Wintering.

ALBERT GALE.

LOOKING back over my last month's article on this subject, I notice the question, "What are the conditions most to be observed in prolonging health and life under climatic changes?" Climate has most to do with the nature of the food adaptable to the wants of various animals. In the higher altitudes herbivorous animals subsist on the scanty vegetable products that thrive during the short summer season. Near the poles the indigenous animals are nearly all carnivorous and insect life is almost, if not entirely, unknown. Cold northern regions are not sufficiently profitable fields to tempt the entomologist to investigate. The honey-bee is not an insect indigenous to far northern climes or the altitudes of mountainous countries. On the lower slopes of these the honey bee is met with in a state of nature. Floral vegetation separates the regions where bee-keeping can be carried on successfully or where it will sure to be a failure. Floral vegetation has its limits. Where it verges on the cryptogamic (lichens and mosses) zone; where the summers are too short and honey-producing flowers too scanty; where, with all the energy and industry bees can put forth, they fail to thrive, even under the guiding and economic hand of man; simply because the floral summer is too limited to give them an opportunity to gather in stores to carry them through the protracted winters. In extremely cold regions these are not all the drawbacks to successful bee-keeping; to them must be added the difficulty of reproduction under such adverse climatic conditions.

Last summer (November) I spent some weeks among the Australian Alps, in the neighbourhood of the Yarrangobilly Caves. The days were warm and pleasant. In the low herbage, flowers were plentiful; among the grasses the white clover was in bloom; in the garden at the homestead where I was a guest, wall-flowers, stocks, and other Northern plants were in flower. The flitting of swallows indicated that insects were sufficiently plentiful to sustain life amongst insectivorous birds. Day after day I diligently sought for indications of bee-life, but every effort was fruitless. Perseverance has its reward, for when on the banks of the Yarrangobilly River, I saw a solitary English bee searching the white clover blooms for honey or pollen. To the warm gullies at the foot of the mountains was not more than 3 miles, but to reach there the bees would have to pass through currents of cold winds. Butterflies and other insects were rather plentiful along the banks of the river and the margins of the creeks. Why did not the bees follow the river banks and work the clover blooms? The cold nights did not militate against the blooming of these hardy exotics, but the nights were too sharp and the winters too long to sustain bee life. But why did not the bees come over the ranges to forage amongst the clover? The clover bloomed more freely in the low-lying valleys, and the climate was warmer, and, therefore, the very same class of flowers gave a greater yield of nectar. Bees, like other animals, thrive best when and where their food is most abundant.

The peculiar vicissitudes of our climate is the thing that tells most against and disheartens lukewarm beekeepers. With them, "what has been is likely to be." The old-world beekeepers, when they come this side of the equator, find that the old methods of wintering bees cannot be relaxed, even in our warmer districts. Winters here do not tell so much against beekeeping—only with the grab-all class—as our hot, long, dry summers. When the hot winds sweep over our plains and up the mountain sides, "and the apple-trees, even all the trees of the field are withered, and the herds of cattle are perplexed and the flocks of sheep are made desolate";—such seasons as the above tell more against the industrious beekeeper than the most severe winter known.

It has been said that bees are the harbingers of civilization. We are told that the North American Indians, in the days gone by, knew of the advance of the whites by the onward march of their vanguard—bees. That may be so, but the limit of the bees' advance would be regulated by the honey-bearing floral zone of the north. Northern regions, with their long winters and short summers, are not happy hunting grounds for bees. True, in some parts of Canada, where the thermometer stands below zero, bees are kept successfully and profitably. During the honey flow season, the yield is so rapid that the bees can gather not only enough to carry them through the long winters but to leave a good margin for the profits of the beekeeper; but I much question if this could be done except under the fostering care of the hand of man. As winter approaches, the bees in Canada are carried into a cellar that is proof against frost and there wintered in comfort. When the spring draws near, each colony is inspected, cleansed, and put in position so that they may commence their summer's duties. I doubt much if any but those who were determined to succeed would go to such trouble but for profit. Some years ago the postmaster at Adaminaby had a fairly good-sized apiary in that cold region, in altitude a little below Kiandra, and carried it on successfully for some years with only ordinary winter protection. Ultimately they were attacked with foul brood, which disease, I think, finally cleared them out.

Bees can withstand great extremes of temperature. Dzierzon found "that a queen that had been refrigerated for some time, although capable of revivication by warmth, never afterwards laid other than drone eggs." Berlepsch "placed three queens for thirty-six hours in an ice-house; two died, but the third recovered." She, too, became a drone layer. In neither case are we told the degrees of frost they were capable of withstanding without death ensuing. The cause that resulted in their becoming drone layers was the freezing of the spermatozoa beyond revivication. The cold was not so intense as to kill the egg-germs within the ovary of these queens referred to; so to keep bees successfully in a climate where the frost is likely to destroy the profitable laying powers of the queen, every precaution needs to be taken to protect them from the cold that is liable to produce such dire results.

Many experiments have been carried out by immersing bees in water, and much good has resulted therefrom. Reaumur found bees recover after nine hours of immersion. In none of these cases of immersion was the temperature of the water named. The experiments were not carried out for the purpose of seeing the amount of cold bees could endure without disadvantageous results but for other important researches. The range in the temperature that bees can endure and survive is astonishing. It is said that the reason Dame Nature has not supplied mankind with a natural clothing is that he may clothe himself according to the climatic zone he wishes to inhabit. Thus it is that man is an animal that can inhabit and be at home either around the poles or under the equator. If Nature has been thus prodigal in the distribution of man over the face of the earth, she has not been much less prodigal with our little friend the bee. Bees can live in a climate far below freezing point, and we know that they do well in this Colony, where the summer heat rises more than half way to boiling point (112°) in the shade. Up north I have seen them clustering outside the hive with a summer's noonday sun blazing down upon them. It will be thus seen that bees can endure great heat. But what about the effects on their delicately constructed wax?

After all, it becomes a question in this Colony what seasons are most injurious to bees. Our beekeepers may well divide the year into beekeeping seasons. The coastal district has its flood and drought seasons, when bees require all the protection it is in the power of their owners to give them. Damp, wet weather is far more injurious to bees kept on the coast than the frosts are to those kept on the highlands. When the outer surroundings of a bee home is damp the inner suffers *pro rata.* The floor, if not kept clean, becomes boggy, and emits a sour, disagreeable odour; unused comb becomes blue with mildew germs; the comb containing stores weeps with moisture, which trickles down to the floor adding much to the troubles already met with there, and the old bees die by the hundreds, which is so much loss to the natural warmth of the already dwindling colony. How is this to be prevented when dampness is in the air and it penetrates even into our own homes? We dry up the damp air by lighting fires in our rooms; and if your colony of bees is kept strong and not too much unoccupied space is permitted in the hive, the natural heat generated by the bees will be a fire to them and dry up the moist air as it enters.

Out west the great trouble with our beekeepers is not the frost or rainy season. Their worst time is when the summer is at its height; when the hot winds blow and the trees cease to bloom, and all the herbage is burnt up. As far as protection and food-storage for bees is concerned, this is their winter. The hives require to be protected from the great heat, or it will be a repetition of what happened at the time when Jonathan went to smite the Philistine's garrison—"there was honey upon the ground"; "And when the people came into the wood, behold the honey dropped." It is not an uncommon experience in the hotter districts, when the hot winds prevail, to see the honey dropping from the hives. Wax will melt at 140°, but become too soft to resist the pressure from the weight of honey in the comb at a much lower temperature.

Under these circumstances, beekeepers in such localities would do well to accept the advice elsewhere given *re* wintering bees, and protect their hives, not against the cold, but against the heat. "What will keep out the cold will keep out the heat." If there be no natural shade protection for the hives they should be protected with extra coverings. But there is nothing like natural shade under these conditions. In the shade of trees there is always more or less air circulating. This will always reduce the temperature in and around the hives. In a previous article I advocated that there should be a sufficiency of honey, about 25 lb., left to the bees to carry them over winter; or, better still, always leave the honey in the brood chamber for the bees' use. If these suggestions be followed in the hot and occasionally famine-stricken districts—famine-stricken as it regards bee-food—our little workers will pull through sufficiently strong for the incoming honey flow.

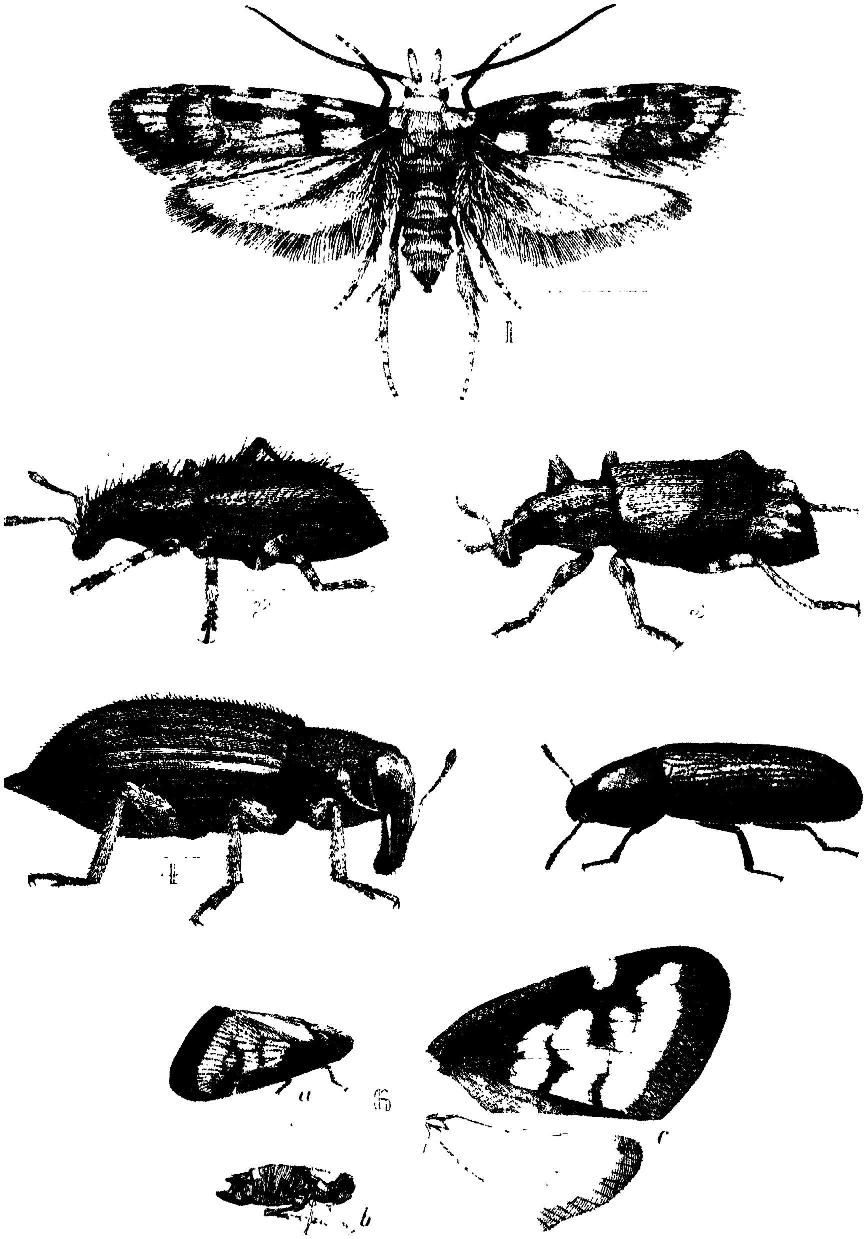
TRIAL OF IMPORTED MAIZE.

MR. J. T. CORCORAN, of Allandale Park, Attunga, reports:—"Last spring I received from the Department of Agriculture three samples of imported maize for trial, viz., Star Leaming, Pride of the North, Longfellow Dent maize. The season here was most unfavourable for maize. Out of a total area of 14 acres I received a return of only 28 bushels—an average of 2 bushels per acre.

I sowed the maize on 18th September, 1899. During the first five weeks of its growth it received about 3 inches of rain, which fell on two occasions. During the remainder of the season, there were one or two very light showers.

The crop from imported seed ripened fully four weeks before crops from the ordinary local grain (Jacob I think the variety was) sown at the same time.

The grain was well formed, though not quite so large as the original seed, and the average yield was from 1¾ bushel to 2 bushels to the acre. The Star Leaming did not seem to grow so vigorously as the other two varieties. Last season, in this locality, could not be taken as a fair test for maize at all. I am going to give the three imported varieties another trial this year, which I hope will be more satisfactory than the last, and I shall report results. I have a little of the original imported seed left over, and in the tests I shall compare the crops from it with those from the seed produced last season, as well as alongside the ordinary local seed.



SOME INSECT PESTS.

1. Moth of Green Orange Grub; 2. The Hairy Brown Weevil; 3. The Grey-banded Leaf Weevil; 4. The Spine-tailed Weevil; 5. The Meal-worm Weevil; 6. Passion-vine Frog-hopper—a, Perfect Insect; b, Side view of body, showing jumping legs; c, Wings.

Entomological Notes on Specimens received during 1899.

By WALTER W. FROGGATT,
Government Entomologist.

THE insects noted or described in this paper are some of those that have come under my observation during the past season; most of them have been received from country correspondents wishing to know something about the names or habits of the creatures sent. Many of the readers of the *Gazette* frequently send very interesting specimens, but for want of complete material I am unable to work out their life histories for publication until more specimens or information come to hand, so that it is frequently a long time before my notes are completed. Many specimens come to the office without a line or note as to the information required about them, whereas the collector or sender's observations would materially help the entomologist.

Directions for forwarding Specimens.

I would be glad if our correspondents would remember that the larval or grub stage of many of our commonest pests are even more interesting than the perfect insects, into which they finally change. When studying their habits I am therefore always very sorry to open a box or tin of grubs that are all mashed up and destroyed, as is frequently the case, when the sender has taken so much trouble and time to collect and forward the specimens, so that I take this opportunity of making the following suggestions:—When sending grubs or caterpillars they should always be packed in a tin, which does not want any holes punched in it, as is so often done, and, in fact is much better without them, for there is plenty of air for the insects in the tin, which, when closed up, also retains the moisture so essential to the well-being of most insects, and will enable them to live much longer when thus enclosed. A square tin will be found the handiest, both to pack and send through the post, and I would always advise tying it up in brown paper, to make it perfectly secure. The packing for soft bodied grubs and caterpillars should be soft, light, and compact; if sent in earth, as is often done, they are liable to be crushed, and if in paper to become bruised; it is better to use dry moss, or the fibrous roots of some of the plants they feed upon teased out and fairly dry; the tin should be filled so that there is no room for the grubs to bump about. Decayed wood, or wood rubbish under the fallen trees or logs, in which many species of wood-eating larvæ are found, is also suitable for the larger grubs; but with the caterpillars feeding upon the foliage of plants, it is better to pack them with some twigs and leaves of the food-plant, which can be packed in so that they will not shake about but allow the enclosed larvæ room to move about, feed, and even pupate during the journey within the tin. Caterpillars of this class should always have their food-plant noted for reference, and the popular or local name of the tree or shrub will generally give some clue to its scientific name.

When the larvæ or perfect insects are found feeding upon foods such as flour, seeds, meal, &c., a good supply of the infested foodstuff should be sent with them.

When the larvæ belong to wood-boring insects, they should not be cut out of the wood, but sent with a section of the wood or tree trunk, a few inches on either side of the infested part, and the wood can then be posted down done up in hessian or brown paper. The twigs of wattles and smaller shrubs can be cut out of the trees in the same manner, and can be packed in a tin box or bundle. Many of the larvæ of wood-boring beetles, particulary those of the longicorn beetles live for several years in the wood, so that it is a matter of time to breed them out. When the cocoons containing the pupæ or second stage of the insect, are forwarded, they are not so liable to injury, so they can be packed in a tin or box wrapped in paper or among shavings or any other kind of soft-dry packing; but where, as in the case of the butterflies and many of the beetle pupæ, they are not enclosed in any protective cocoon, they require as careful packing as the grubs and caterpillars. I would also point out that where a pest, or other uncommon insect is numerous, as is often the case, I am always anxious to receive a number of specimens, twenty at least, for unless one has ample material, it is impossible to work out their life histories in a satisfactory manner: a certain percentage die under the changed conditions, others must be dissected and probably destroyed in the identification of the species, while the remainder are carefully watched to observe their transformations.

If any distant correspondent will let me know that he is willing to send specimens to this Department, I can always send him one or two of our official covers, which will carry the specimens to us free of cost to the sender, if handed into the post-office.

When the packets are sent for the entomological branch, it facilitates the work of the clerks if their contents are marked on the back as "Insect Pests" or "Entomological Specimens."

The Ambrosia Beetle (*Xyleborus solidus*, Erich).

This curious little beetle is rather plentiful about Sydney, and is frequently sent to us taken out of the trunks of fruit trees, which it is supposed to have killed; but in all cases that have come under my notice, it has nothing to do with the tree dying, but is attracted to the tree as soon as it becomes sick, the bark begins to wither, and the first symptoms of decay set in. The instinct that leads these and other wood-boring beetles to a tree as soon as it is sick, is something marvellous; in the tropics I have collected many fine rare species upon the freshly-cut tent poles in our camp, attracted to the wood, but otherwise seldom found in the bush.

Recently, at Hornsby, a large apricot tree died out in an orchard, and the owner found a number of cylindrical holes dotted over the trunk and main branches, from which he observed fine streams of wood dust pouring. On further examination he extracted the industrious little borers, and sent them to me under the impression that they had killed the tree. I visited the orchard, and found that though most of the tree had been burnt, enough remained to show the work of the insects that were then running over the trunk, as well as making the cylindrical bores in the timber. These beetles belong to a very interesting group of borers that have been called the Ambrosia beetles, from the fact that these tunnels are not only cut through the bark, but penetrate deep into the timber, and though they twist and turn with many ramifications, frequently forming curious patterns, yet the tunnels are of a uniform size, and clear of all dust of wood and refuse.

Mr. H. G. Hubbard has written a most interesting account of the American species of the group, entitled "The Ambrosia Beetles of the United States" (*Bulletin* No. 7, (New Series), United States Department of Agriculture, 1897), to which I am indebted for an account of their habits, and have been led to notice the tunnels of our species, which differ from those of the closely allied bark and sap-wood boring *Scolytidæ*, though the beetles superficially differ very slightly from the latter. The most remarkable fact about the Ambrosia beetles is that their food does not consist of the wood, but of minute fungi that grow upon the freshly cut walls of the tunnel; the females deposit their eggs upon the floor of the chambers so that the larvæ, surrounded with a plentiful food supply, live and grow up with the adult beetles. Hubbard says—"In 1844 Theo. Hartig published an article on the Ambrosia of *Xyleborus* (*Bostrichus*) *dispar*, in which he showed that it was a fungus growth (pilzrasen) and he named the fungus *Monilia candida*." One of the most remarkable facts is that each group of beetles is associated with a certain kind of ambrosia or fungus, notwithstanding that they are found in different timbers. This substance is actually cultivated by the mother beetle upon a layer of wood débris generally at the end of the gallery; but in others "the ambrosia is grown only in certain brood chambers of peculiar construction, in others it is propagated in beds, near the cradles of the larvæ."

The galleries caused by our species (*Xyleborus solidus*) show a distinct growth of fungus in the wood of apricot tree examined, and there is a promising field for some of our field entomologists to take up in studying the habits of our ambrosia beetles.

Xyleborus solidus, is of a uniform black colour, with the legs and antennæ of a reddish brown tint; length slightly over one-eighth of an inch, stout and cylindrical in form. The head is turned down and hidden from above with the large rounded thorax, very nearly as large as the body, half forming a sort of cowl or hood above it; the front portion roughened and covered with short rasp-like points, the hind portion and the basal portion of the wing covers smooth, shining, and showing fine punctures, the hind portion of the wing covers flattened and truncated to the tip, showing fine parallel striations; the whole beetle clothed lightly with fine reddish hairs.

This beetle belongs to the family *Scolytidæ* and the genus *Xyleborus* contains a number of species all having the same peculiar habits, as far as they have been observed, but they are very difficult beetles to identify, as the males which are much smaller than the females always remain in the tunnels, and thus are seldom collected, and it is only in this sex that they show any specific differences, the females of several species being so much alike that, without the males, it is a matter of great doubt to determine them.

Some of the American species are known to do a little damage to fruit trees, not always in a sickly condition, and one *Xyleborus dispar*, both in Europe and America, has been recorded as doing some damage to fruit trees, but in most cases only on the young branches.

The Meal-worm Beetle (*Tenebrio molitor*, Linn).

This is one of those cosmopolitan beetles that has spread all over the world with the carriage of foodstuffs from Europe, its original home; and an interesting instance of how it has been introduced was brought under my notice by Mr. Butler, one of our inspectors. He found a large package of seeds, bulbs, &c., sent from an English firm, full of the slender, shining brown larvæ of this beetle, which he forwarded to me. The larvæ were full-grown, and soon changed to pupæ in the breeding-cage, and within a fortnight afterwards the perfect beetles emerged.

These beetles breed in corn-bins, flour, bran, or among the rubbish often plentiful where such things are stored, and are very common in stables in the corn-bins, and such localities. The larvæ are about three-quarters of an inch in length, slender, cylindrical, smooth and shining, light ochreous brown in colour, with darker brown bands on the lower margin of each segment, the head rounded and turned down in front, and the last segment of the abdomen conical, armed with two small black spines turning upward.

The *pupa* measures slightly over half an inch in length, of a general light reddish yellow colour; the dorsal surface arched with the eyes hidden when viewed from above; the wing covers small, and the antennæ and legs bunched together. The abdominal segments are flanged along the sides, each flange marked with reddish brown on either edge, and a row of fine spines of the same colour along the edges of the last two segments, forming a conical point terminating at the tip with two divergent spines.

The *perfect beetle* is of a general pitchy black colour, varying to chestnut brown, somewhat elongate in form, with the head rounded; eyes small and slender, eleven-jointed antennæ. The thorax is subquadrate, the wing covers (elytron) elliptical, marked with fine parallel furrows, the wings folded beneath them large and smoke-coloured.

These with several other beetles are frequently met with in stored flour in the larval state, and a great deal of the out-back country dwellers know only too well what "weevily flour" is like, and the offensive smell it has when badly infested.

Remedies.—Keeping all stored corn or flour in rooms that are clean and well swept, and fumigating the place with bisulphide of carbon will destroy them if done in well-closed rooms. Sifting the flour before using is generally carried out on stations now, but in the good old days it was no uncommon thing to see the damper when cut dotted all over with weevil-grubs nicely cooked and looking like currants.

The Grey-banded Leaf Weevil (*Ethemaia sellata*, Pascoe).

On the 15th of August, Mr. I. Sheather, of Stockinbingle, sent a number of legless green caterpillars to the office, and reported that they were nocturnal pests, doing a great deal of damage to his garden. He said: "I was never troubled with this grub until this season; they feed by night upon many of my flowering plants, eating the foliage, and thus killing many of my annuals. I could not find them at first, but on going out at night with a lantern, I found them swarming upon the underside of the leaves; but as soon as they were disturbed by the light they dropped to the ground and buried themselves with wonderful rapidity in the light soil. On digging into the soil next morning, I found numbers at a distance of from 6 to 8 inches below the surface."

Larva, 4½ lines in length; general colour, pale green to greenish yellow, legless, and lightly clothed with short hairs. The head is small, ochreous, rounded on the sides, and showing no lobes, the mouth part dark-brown; the first thoracic segment smaller than the preceding, of uniform thickness, but tapering to the tip, smooth and finely wrinkled on the dorsal surface; ventral surface, showing prolegs in each segment, the terminal one produced into a rounded tubercle. These grubs pupated, soon after I received them, in damp sand at the bottom of a breeding-jar.

Pupa.—Length, nearly 3 lines; general colour, pale green, with the snout, legs, and tips of the wing covers semi-transparent; the abdomen clouded with yellow down the centre. The head narrow, rounded, the snout short and thick, the antennæ folded back under the eyes, distinctly clubbed; the whole of the dorsal surface, legs, and snout lightly clothed with short spiny hairs; thorax narrow, the wing-cases curving round in front; the abdomen broad, rounded, with the tip arched round and armed with a stout tubercle on either side. The first specimens were noticed in the pupal state on the 18th of September, and the first beetle emerged on the 2nd of October; from this date beetles came out every day for a week.

Perfect insect.—Length, one-third of an inch. The general colour is dark-brown and grey, forming an irregular pattern over the thorax, body, and legs; the upper surface is very rugose and deeply pitted with coarse punctures, and the whole surface covered with white and brown scales corresponding with the ground colour beneath; above this is a scattered growth of short feather-like black and grey hairs, those upon the head and legs all grey and longer; the head flattened above the eyes, with two raised knobs between them sloping down below to the mouth, the antennæ reddish-brown, first joint large and thickened at the apex, last ones forming a club; eyes, large, rounded, black; tarsi of legs and snout covered with coarse hairs; thorax rounded, rather cylindrical, widest in the centre, very rugose; elytron deeply ridged and rugose with the apex truncated, and four small irregular rounded knobs on either side above the tip. The larval habits of this curious weevil are very remarkable, as very few of the curculio larvæ have any power of moving about, and are usually obese, legless larvæ feeding in timber or under bark. I do not know of any species with such active movements; it is quite abnormal in this respect.

Remedies.—Probably the best method to get at this pest would be to sprinkle lime under the plants infested, so that it would come in contact with the grubs when they came to the surface to feed. Spraying the under-surface of the foliage with Paris green would also be a simple method of destroying the grubs.

The Hairy Brown Weevil (*Prosayleus comosus*, Germ).

Towards the end of October, through the kindness of Mr. H. H. Woodhead (Editor of the *Federal Standard*), Wentwoth, I received a packet of these beetles, with the following information. "These beetles are attacking not only the foliage of fruit trees, but also the stems of young plants, and infesting shade trees and vines in the local gardens, and causing them to go off and look sickly."

This beetle belongs to a genus of Australian weevils formed by Schonherr in 1840, and this species was described by Germer, *Linea. Entom.* vol. III, 1848, p. 213, from Adelaide. Until this season, I have never heard of it doing any damage in gardens, and it is probable that the natural food supply of these beetles has been destroyed by the years of drought, so that it has had to take to some cultivated plants to exist.

This beetle measures slightly over a quarter of an inch in length, of a ground colour of dark brown, but so thickly clothed with white and brown scales that they have a much lighter tint, with the scales forming parallel greyish bars down the elytron. The undersurface is thickly coated with white scales, and while the dorsal surface is clothed with long scattered black hairs, those upon the legs, sides, and ventral surface are grey or white. The head is short and stout, antennæ thick, standing out from the sides of the head and clubbed at the tip, the eyes black, the thorax short and broad, rounded on the sides, the abdomen short, rounded, elliptical, pointed at the tip.

The most striking point about this beetle is the remarkable growth of long black hairs over the upper surface of the body.

Remedies.—Though my correspondent does not state when these weevils do the damage to the trees, I presume that they feed at night, like most of our plant-eating species. If this is the case, hand-picking with a lantern at night, or spreading a sheet under the infested trees and giving them a sharp shake or jar, would cause the beetles to fall and they could be gathered up and destroyed. A very slight movement will cause most weevils to let go their hold of a plant and drop to the ground, where they lay perfectly motionless, feigning death until they think all danger has passed, and it is in consequence of this habit that they are so easily collected by shaking over a sheet.

The Spine-tailed Weevil (*Desiantha caudata*, Pascoe).

This is another small ground-living weevil that, like the former, has probably been driven to find a new food supply in consequence of the failure of its own particular food, through the dry seasons. Towards the middle of October, Mr. L. Brown, of Condobolin, forwarded a number of these beetles to the Department, with a note to say "that they are very destructive to the foliage of my fruit-trees."

When in the Condobolin district later on in the year, while insect-hunting along the edge of some swampy flats, I found numbers of these weevils sheltering under the dead wood and logs lying on the ground, but did not notice any feeding upon foliage; but as many of the weevils only feed at night, they might be easily passed over.

This beetle measures slightly over ¼ inch in length, head and thorax small, thorax broad, turning down at the apex, and either side of the elytron produced into a sharp stout spine turned up slightly at the tip.

General colour dark brown, the upper surface very rugose, particularly on the snout and head, the elytron being marked with parallel striæ also finely punctured. The whole of the insect is covered with minute elongate grey to light brown scales, thickest upon the elytron, which is also clothed with scattered black hairs. Upon the hind legs and the sides the scales are replaced to a great extent with grey hairs.

This beetle was described by Pascoe in the Transactions of the Entomological Society of London in 1870, p. 194. His specimens came from Victoria.

The remarks made upon the last-noted species of weevil apply equally to this one, as their habits and methods of feeding are identical.

The Green Orange Grub (*Paramorpha aquilina*, Meyr).

About the middle of March, while visiting an orchard at Galston, my attention was called to a number of oranges that were turning to a rich yellow tint while the others were retaining their natural green tints of that season. On examining several I found a small circular hole through the skin, beneath which the caterpillar was feeding upon the orange. It at first sight looked like a light-coloured codlin-moth grub; and, in fact, I have had several sent me from orange orchards as "codlin-moth grubs attacking orange." I was fortunate enough to breed out a single moth early in May from several chrysalids kept in the breeding cages, which turned out to be this moth, which was described by Meyrick, in the Proceedings of the Linnean Society, N.S.W., vol. 6, 1881-82, p. 697. He placed it in the Family Conchylidæ of the *Tortricina* in which the well-known codlin moth is also included, and described two species, one from New Zealand, and this from Australia; he says: "The moth frequents damp or swampy ground, flying low among the herbage; it occurs tolerably commonly round Sydney and Parramatta, and at Blackheath, on the Blue Mountains (3,500 feet), in September, and again in February and March."

Nothing is known of its life history in its native state, but there is no native fruit like the orange that its larva could feed upon in these districts.

Larva.—About 4½ lines in length; general colour pale green with the head and first thoracic segment ochreous; the mouth parts ferruginous; the dorsal surface marked with reddish brown, and a pale stripe running down the centre of the back. The head is small, smooth, rounded and lobed, with a few hairs upon the sides; the legs very small, armed with fine tarsal claws, the following segments furnished with the usual pro-legs.

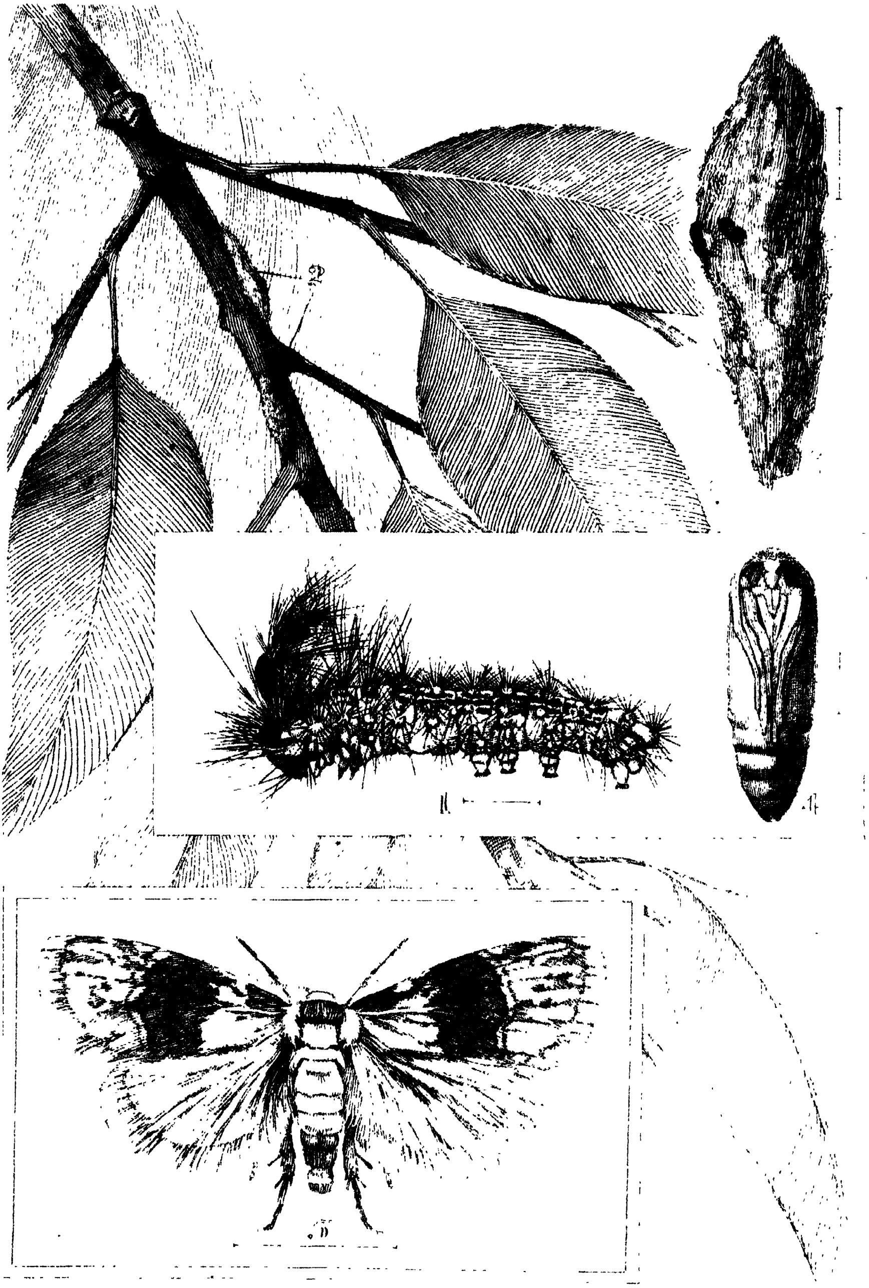
The oranges containing these grubs were examined on 28th April; there was a good.deal of decayed tissue round the damaged portion below the puncture, where the grub was found to have changed into the pupa, head downward just beneath the skin.

Pupa.—Length 3¼ lines, stout, and cylindrical, of a uniform light greyish brown; the eye spots darker. The dorsal surface smooth and very slightly wrinkled; head portion small and curved forward, eye spots very large, antennæ very long, curving round to the front and extending beyond the tips of the folded wings, the latter closely folded round the ventral surface, and nearly reaching to the lower margin of the 8th abdominal segment; abdomen constricted to a conical point at the anal extremity.

Moth.—The moth was discovered resting upon the earth at the bottom of the breeding jar, with the long frontal lobes of the face and the antennæ turned downward.

This moth is about the same size as the codlin moth, the female measuring about ¾ of an inch across the out-spread wings, and the male fully a third smaller. The male is of a general silvery grey colour, with the eyes black, the antennæ and legs light brown. The forewings are finely spotted with dark brown, which forms a regular pattern at the tips. The female has the same general ground colour, but the forewings are richly blotched with large irregular black spots which form an irregular pattern.

Remedies.—It would be advisable to gather and destroy all oranges noticed in the early part of the season, and if attacked early in March they could be easily picked off, but the second crop of moths might be more difficult to observe in September. If this habit grew with the civilisation of the moth this pest might become as bad as codlin-moth with the apple, so it is worth watching.



SOME INSECT PESTS.

Seedling-gum Caterpillar. 1. Caterpillar; 2. Cocoon of pupa on twig; 3. Cocoon (enlarged); 4. Pupa; 5. Moth.

Seedling-gum Caterpillar (*Nola metallopa*, Walk).

During a visit to one of the Plant Nurseries at Botany in the early part of the year, a considerable number of the caterpillar of this moth were found feeding upon the foliage of the Western Australian Crimson-flowered Gum (*Eucalyptus ficifolia*) growing in the seed-beds. The man in charge said that it was a constant pest with them, frequently disfiguring numbers of the seedlings by stripping off their foliage.

The caterpillar is about half an inch in length, the colours in the immature specimens varying from almond white to pale yellow, but in the full grown larvæ much darker. The general form is slender, the sides and ventral surface pale yellow, with lines of alternate black and grey running from behind the head to the anal tip of the former portion, the dorsal surface grey. The head is rounded, with the eyes black and surrounded with pale yellow, out of which spring a number of black hairs, on the summit of the head rises a regular pyramid, apparently formed of the successive moulted skins of the head, which, becoming attached to the hairs upon either side, are not cast off with the rest of the skin, but remain one above the other like an ornamental head dress. The sides of each segment bear two rounded tubercles, clothed with long grey hairs forming a regular rosette; the dorsal surface of each segment with a light creamy grey tubercle on either side of the dorsal stripe, surmounted with similar grey hairs, which are shorter than those on the sides; the apical segments of the abdomen narrower; the anal one rather truncated, bearing seven small rounded tubercles.

The Pupa.—When the larva is full grown it crawls on to the stem of the tree, and attaching itself to the bark makes a tent-like cocoon or silken sheet attached to the bark all round the edges, of an elongate oval form, covered with bits of bark, and so exactly of the same colour as the bark to which it is attached, and sloping down so naturally at the extremities, that it requires a very careful examination to detect them if there are several on the same stem, as they appear at first sight to be simply swellings of the bark.

The enclosed chrysalid measures about 4½ lines in length. General colour pale reddish brown, slender and cylindrical in form. Viewed from the upper surface it is rounded at the apex of the head, contracted behind where it joins the thorax, the first four abdominal segments enclosed with the wing-cases are small, the others larger, and the one rounded to a conical tip. Viewed from below the eyes are very large, wing-covers long and ample reaching to the apex of the fifth abdominal segment, legs and antennæ folded straight down in front.

The Moth.—The first moth came out in the middle of February and several came out during the week. The length across the outstretched wings was just under an inch; the length from the front of the head to the tip of the body, 3½ lines. The general colour of the upper surface of the wings is silvery grey, with the fore wings transversely banded with a small barb of metallic coppery brown near the shoulder, and a much larger one of the same colour near the centre of the wing, tapering to its hind margin, with the outer edges also slightly mottled.

The head is small, with long palpi, small eyes, and long slender antennæ; a fine grey band crossing the apex of the thorax, above which is a broad band of coppery scales; the hind wings of a uniform greyish brown colour.

Remedies.—The simplest way to get rid of these little caterpillars is to spray the seedlings with Paris green, 1 oz. to 10 gallons of water.

This is a comparatively rare moth in collections. Mr. Lyell, of Gisborne, informs me that he only had one in his collection before I sent this specimen over. It belongs to the family *Arctiadæ* which contains a number of small moths.

The Banana-stalk Maggot (*Nerius lineolatus*, Wiedman).

When our fruit inspectors first commenced their work upon the wharfs inspecting the Queensland bananas for fruit-fly maggots, in the over-ripe and damaged fruit they noticed that the butts of the stalks of the bunches, which had commenced to rot in the hold of the ship, were full of similar but smaller looking maggots, which some of our intercolonial experts declared were true fruit-fly maggots.

I obtained a number of these stalks and set to work to breed the larvæ in the office, for though the maggots were very much like small fruit-fly larvæ, I did not think they were those of *Tephritis Tryoni.* Within a week they pupated on the outer surface of the decaying stalk, producing a very peculiar pupa-case; pupa slightly over one-fourth of an inch in length, dark reddish-brown in colour, largest at the base, tapering to the tip, which is slightly turned up, the segmental divisions showing. Within a fortnight a number of the flies emerged from the pupæ among the damp sand.

The fly is very peculiar in form, of a general chocolate brown tint, with three parallel light brown bars down the thorax. Length from front of antennæ to tip of the wings under half an inch, length of legs from the tip of the hind-leg to the outstretched fore-legs about an inch. The head is large, elongated, truncate at the base, tapering out and rounded to the pointed tip, the antennæ long, consisting of several stout joints springing out from the tip of the head, the last segment forming a long stout tapering bristle; the eyes flattened along the sides of the head, elongate, oval. The thorax rounded in front, long, of uniform width, rounded, and slightly constricted at the junction with the abdomen, which is elongate, shorter than the thorax. The wings are long and slender, rounded at the tips, semi-transparent, with slender parallel nervures; the legs very long and slender, standing out on the sides.

The life history of this slender long-legged fly, so very different in all points when fully developed from the true fruit-fly, shows how careful one should be in identifying flies from their larvæ. In general appearance the young maggots are very similar even to an expert eye; but as soon as they change to the pupæ the likeness is gone, for nothing could be more unlike than the short oval rounded pupæ of the fruit-fly, and the elongated slender dark-coloured pupæ of the banana-stalk maggot.

These flies are not known to do any damage to fruit, but simply feed upon the decaying vegetable tissue of the banana stalks, so there is no danger to orchardists from this insect.

The Cattleya Fly (*Cecidomyia sp.*).

Early last May, Mr. H. Dixson, of Summer Hill, sent me some curious rounded lumps of roots which he stated were gall-like swellings upon the exposed roots of his Cattleya orchids, and doing them a considerable amount of damage. The gardener said that until they introduced some plants bought at a sale into his orchid-house the place was clean, but the introduced pests had infected many others.

I examined the excrescences received, and found that there was a cavity in the centre of the gall containing a small pale-yellow legless maggot, about 2 lines in length, broad in the centre and tapering to the tip. The "anchor" or "breast bone" process is very distinct, the curious appendage is reddish brown in colour, long and slender, with a double prong at the extremity and forming a straight line down the ventral side.

"This anchor process" shows beyond doubt that the maggot is the larvæ of a "gall-gnat," belonging to the dipterous family *Cecidomyidæ*, which only possess this breast bone in the larval state. In the January number of the *Gardeners' Chronicle* (14 Jan. p. 23), Mr. W. H. Young, in "Orchid Houses," gives an account of the Cattleya fly and its grub, and though he describes a very similar excrescence upon "the mucilaginous tips of the roots," he figures a hymenopterous insect *Isosoma orchidearum*: one of a group of small wasps that feed upon vegetable matter, one of which does a great deal of damage to wheat and growing crops in America.

This insect is certainly not the same as our species under observation. In 1881 Professor Westward published a short note upon this *Isosoma* in the *Gardeners' Chronicle*, which he said had been introduced into England in the buds of a species of *Cattleya*, a Brazilian and Mexican genus of orchids. In 1882 he read a paper before the Entomological Society upon "the supposed abnormal habits of certain species of *Eurytomides*," a group of the Hymenopterous family, Chalcididæ, p. 307, plates XIII and XIV.

Whether this is the larvæ of Westwood's Isosoma, as figured by Mr. Young, or the Cecidomyia larvæ, his treatment would probably be equally effective.

He says: "at first I used to remove the roots on which the eggs were laid, doing probably more harm than the grub; but now I let them alone until the growing point has got a few inches beyond the affected part, and then carefully pick out the grubs with a knife-point, and thus in most cases save the roots from destruction."

I was unable to breed any specimens from the bits of roots sent as they could not be kept damp enough, and think that the only way to obtain the gnats would be to cover an infested Cattleya with a fine gauze net, and catch the gnats as they emerge. I have not heard if this fly is in any other Sydney gardens.

The Passion-vine Frog-hopper (*Pochazia Australis*), Walk.

Early in last January Mr. H. E. Ford, of Bega, forwarded specimens of this insect, and wrote: "These pests prevented a very fine passion-fruit from maturing its crop, and in consequence of their attacks, all the green fruit withered and fell before it was ripe. I have one of your Fruit-growers' Guides, but cannot identify the insect, and shall be glad if you will give me some means of destroying them. The winged black insects seem to follow on after the white ones. The former are becoming very thick upon the vine, the latter are decreasing in numbers." Shortly after this I received the larvæ, and afterwards the perfect insect, from Mr. James Inglis, "Cragie," Strathfield, where the larvæ were found injuring the young fronds of his ferns. Some time ago I found a passion-fruit vine in my garden at Croydon covered with the larvæ of this frog-hopper, which by sucking up the juice brought all the leaves off the vine. It has also been sent to me from Fiji, where it is said to do similar damage to plant foliage. The adult insect lays her eggs, inserted by a sharp pointed ovipositor, in the tendrils of the passion-vine, in rows of about half a dozen, the eggs being elongate, oval, and semi-transparent. The little flea-like larvæ crawl out into the foliage or young stalks of the plant, and inserting their sharp little beaks into the tissue divert the sap to their own use, and as they flourish and grow the plant suffers, and if neglected and the pests are numerous, dies. When very young, of course, they are hardly noticeable; when full grown the pupæ are pale green with darker eyes, the head pointed and conical, with the eyes large and placed upon the sides of the head, and the sharp style-like beak hidden and folded along the breast between the fore-legs, when not erected and employed in sucking up sap. The little bags (wing pads) from which the adult insect develops its large wings, are close upon the sides of the thorax, the abdomen small and covered with long white filaments, which sometimes nearly cover the whole of the frog-hopper. The legs are long with the hind pair spiny and adapted for jumping, so that when you touch one he jumps like a frog, from which habit this group of insects have obtained their popular name of "frog-hoppers." The adult insect measures about ¾ of an inch across the wings, and is of a general light chocolate brown colour, but somewhat variable in markings of the wings, with a short broad head turned down in front; and with the beak forming a triangle when viewed from the front, the thorax and body are short and stout with the first two pairs of legs simple, but the tibiæ (shanks) of the hind pair very long, thickened and armed with large stout spines, so that they can jump in a similar manner to the larvæ as well as fly.

When closely examined the venation of the wings will be found to be very beautiful, both pairs are narrow at the base, swelling out and broadest near the apex and slightly rounded at the tips. The fore pair much the larger, with the front and hind edge broadly margined with chocolate brown; the central portion of wing semi-transparent, slightly mottled with the same colour, with the multitude of fine nervures crossing it of a brown colour; the hind pair much more lightly shaded with brown. This insect belongs to the Order *Homoptera*, and is placed in the family *Fulgoridæ*, which contains the so called lantern-flies. Others, like our pest, are very like moths in outward appearance. This species was described from Australia by F. Walker, in the British Museum Catalogue of Homoptera, 1858.

Remedy.—In response to Mr. Ford's inquiry I advised spraying with kerosene emulsion, and shortly afterwards he reported that it was a most efficient remedy, and that one application had destroyed all the insects infesting his passion-vines.

How to Succeed in Growing Onions.

At the outset, I would like to say that success in growing this crop is not possible without well-directed effort. This means that the soil must be well supplied with plant-food, either naturally or through years of manuring and fertilising. I do not mean to say that there can be no good results where the ground has not been especially prepared. I have succeeded fairly well where I have begun to fit the ground the first season of planting crops, but when this is done I would suggest a liberal application of barnyard manure. Plough this under deeply, using the jointer.

This is a good beginning, and when the roots of the crop reach the manure the plants will grow rapidly, if the ground is fairly moist. This stable manure, however, will not be sufficient, and it will be necessary to apply some quick-acting fertiliser, as nitrate of soda, to the surface when the plants most need it. Be sure to get barn-yard manure that is free from straw, as unrotted material interferes with cultivation. Where an application of fertiliser is made to the surface of the soil, it must be well worked in to give the plants a rapid growth. After the ground is ploughed, great care must be taken to pulverise the surface thoroughly, for several reasons. During the dry season, unless the soil is well compacted and finely divided, the air will get into the upper layers and remove all the moisture, so that there will not be any left to germinate the seed. Then clods choke the tender sprouts until they are smothered and never get to the surface. The ground must also be well drained, for if water accumulates during a wet time the seed will rot.

Next secure good seed, for failure will surely result if this is not looked after. I would suggest obtaining seed of the latest improved varieties. Drill in the seed as early as the ground can be safely worked, as I find that early sown onions are the best, especially where blights, mildews, and rusts are abundant. My onion field has been wholly free from these pests, but any field is apt to be attacked. An extra effort must be made after the seed is in the ground to keep down the weeds, for if they once get started it is difficult to eradicate them, because of the smallness of the young onion plants. Go over the ground often so as to form a soil mulch, and thus conserve the moisture and keep the hard crust broken up.—J. P. Underwood, Ohio.

Our Western Lands.

THEIR DETERIORATION AND POSSIBLE IMPROVEMENT.

R. W. PEACOCK.

THE present condition of the vast area of our western lands, as compared with its primeval condition, when the aboriginal, kangaroo, and emu reigned supreme, points to a period of deterioration unexampled in the history of New South Wales. In the early days of pastoral occupation the pioneers found ample scope to depasture their scanty herds upon the virgin pastures of the west, which were looked upon at that time as some of the most profitable pastures throughout the country. Within the last decade the high opinion formerly held by the leading pastoralists has been changed, to the extent that the once coveted western properties have in many cases been abandoned by their former holders, and many millions of acres, under their present condition, are beyond the scope of profitable occupation. I do not wish to attempt to prove that these lands have seriously deteriorated. This will be admitted by all those with an intimate knowledge of the western division. I purpose rather to enter into the causes of the deterioration, to view the conditions prior to settlement, and also to treat upon some of the methods best calculated to prevent a still further depreciation of sections of the division which have not, as yet, suffered to the extent of the at present unprofitableness; as well as to express opinions upon the best means to reclaim these waste lands and, if possible, to bring them to a semblance of their former condition. The following observations and opinions are based upon my experiences in the eastern portion of the western division, on the land comprising what has been termed the "West Bogan Scrubbed Lands." Many of the views are only applicable to the above-mentioned area, whereas others may be applied to the whole of the western division. The whole of this area is rightly considered one of uncertain rainfall, and the conditions are decidedly arid. The majority of the vegetation is peculiar to the district, being the outcome of the dry environment, and in its primeval condition was admirably adapted for the support of animal life throughout prolonged periods of dry weather. This alone would lead us to believe that periodical visitations of drought have been the rule in Central Australia, such conditions evolving the valuable drought-resisting trees and plants which formed the principal feature of the pristine vegetation. At the present day the number of varieties of edible trees and shrubs is truly remarkable, and all of these possess characteristics which render them drought-resistant. But since the increased demand upon these plants by the millions of sheep and cattle depastured, many varieties are well nigh extinct, leaving only isolated specimens, in protected areas, to give a slight idea of their prevalence before the advent of settlement.

A Typical Tract of West Bogan Country—Unscrubbed.

West Bogan Country—Scrubbed.

Nature of Soil.

The soil of the Western Division may be divided into three classes: Firstly, the undulating red country, of older geological formation, with its gravelly ridges and sandy loam flats.

Secondly, the stretches of red, shifting sand forming sand ridges and level areas, apparently liberated by the action of the weather from the former.

Thirdly, the more recent alluvial deposits of a greyish, black, loamy clay adjacent to the rivers, being formed from the sediment precipitated during times of flood, forming large areas stretching many miles from the present watercourses, caused by inundation and the constant shifting of the river beds.

These three natural divisions have vegetation peculiar to themselves, being less marked between the first and second than between these and the third division.

The sandy areas are the most barren, possessing sparser vegetation, and of poorer quality. The sandy loams and the heavier soils of the second division possess most of the plants found on the former, but of a more luxuriant and denser character. The third division is marked by an abundance of the best grasses, salt-bushes, and herbs, lacking many of the varieties of edible trees which are so abundant upon the red country. These divisions, before the advent of man and his herds were endless tracts of open forest country alternated with open saltbush plains; the principal large trees being the eucalypts, with numerous acacias, such as mulga, myall, Yarran, Gidgee, ironwood, and many others commingled, as well as kurrajongs, supplejacks, and other edible trees, shrubs, and saltbushes. In the early days of settlement, the cattle and sheep were kept almost solely upon the river frontages, they only going back into the red country when the rainfall allowed of a sufficient water supply in shallow cowals and gilgais, and returning when the conditions were not so favourable.

The comparatively light losses of early droughts were due to this lack of water, cattle dying in hundreds, with an abundance of grass upon the unwatered country. At this time, in good seasons, the red and black ground alike were covered with luxuriant grasses to the height of many feet. The red ground produced such grasses as the Kangaroo (*Anthistiria*), the three-awned grasses (*Aristida*), the various panicums, danthonia, mulga, and other grasses. Upon the black ground, the Mitchell (*Astrebla*), blue-grass (*Andropogon*), panicums, &c., could be found in great profusion, in many cases resembling wheat crops. In the early droughts these would be dried up and blown away by the wind, the only green vegetation being found around depleted watercourses, cowals, and gilgais.

The lowlying patches have done much for the survival of many of these grasses, and are essential to the economy of the droughty districts. Light showers, running off the bare land, replenish these small holes, and provide sufficient moisture to enable the grasses to mature seed.

When the means of communication were improved by the construction of railways, &c., water conservation, by means of excavations and dams was made possible, thus enabling land which was valueless for the greater part of the year to be continuously stocked. From that period the deterioration of the country, especially the red country, set in.

Nature, in evolving the economic vegetation to its present state of drought-resistance, did not take into consideration the artificial change in its environment, such as the system of stocking which has been practised during the last twenty years, with the result that the majority is eaten out, leaving only isolated specimens to propagate the species upon the return of more favoured conditions. Nature, in order to recover her equilibrium, is at present producing vegetation capable of adapting itself to its altered surroundings by its unpalatableness and protective spiny growths, such as pine-scrub, box-seedlings, and the spiny saltbushes. That such has been the case is apparent to every casual observer who notes the entire absence of grasses or herbage amongst the dense growth of injurious scrub upon the red lands, which fifteen years ago were open forest, well-grassed country.

This deterioration has gone on also upon the rich black river country, although not to such a marked degree on account of the absence of injurious scrub, but instead of the many varieties of palatable saltbushes, only the "roley-poley" and other spiny salt herbs and bushes can be found.

In places unprotected from the perpetual summer winds, and in situations calculated to allow of excessive weathering, the ever-increasing scalded plain consisting of a bared subsoil is to be found. All these are too familiar landmarks, resulting from the mistakes of the past, and calculated to teach valuable lessons to those willing to listen to the voice and teachings of Nature. That this condition of things is due to the over estimate placed upon the grazing capacity of the country by its holders cannot be gainsaid, for without their vast herds it could not have depreciated to its present state.

Rabbits have been credited with a large share of the mischief; these troublesome rodents have undoubtedly done harm, principally in preventing pastoralists from utilising the grass devoured by them for their flocks.

But the fact remains that the land has deteriorated quite as quickly upon adjoining similar lands off which rabbits have been kept by wire-netting—no rabbits in the history of occupation having been upon them. We must therefore look further than the depredations of rabbits for the principal causes. Droughts in conjunction with over-stocking have been the principal factors, and the pioneers had not the severe lessons of the last seventeen years to warn them.

Nevertheless it is apparent that the policy of the past respecting the treatment of these lands in many cases proved a complete, and in others, a comparative failure. The system which has been followed in most places has taken no cognisance of suitable subdivisions and periodical resting of stocked areas; with the result that they have

Some Fodder Plants in their Natural state.

1. *Polygonum vulgare.* 2. *Atriplex leptocarpa.* 3. Barrier Saltbush, *Enchlyæna tomentosa.*
4. Cottonbush, *Kochia aphylla.*

Saltbush that is given a chance in the Coolabah Experiment Farm Paddocks.

The large bush is *Atriplex nummularia* ; the creeping variety, *Atriplex semibaccuta* ; and the third been continuously stocked, preventing the many grasses, saltbushes, and edible trees from propagating themselves by their natural means of reproduction.

In good seasons this only resulted in the most palatable varieties being eaten out, but in periods of prolonged drought the majority were destroyed, leaving among the grasses only such varieties as "Number Nine" (*Aristida calycina*), "Corkscrew" (*Stipa scabra*), and "Kangaroo grasses" (*Anthistiria*) upon the red country, these possessing seeds of such a nature as to ensure their distribution and germination under very adverse conditions. Upon the black ground similarly treated the best saltbushes have been annihilated, the spiny *Sclerolæna bi-cornis* and other members of the family, as well as the (*Kochia*) roley-poley forming the greater portion of the vegetation. It will thus be seen that it is only those plants possessing protective growths, or other characteristics such as unpalatableness and drought-resistance, which have been enabled to adapt themselves to the altered conditions, thus taking the place of more valuable vegetation, and causing the depreciation of the western pastures.

Upon the red country the pine-scrub, box-seedlings, and budtha have taken complete possession, to the thorough exclusion of even the worst grasses.

The black country, not proving suitable for the injurious scrub-growth, has not deteriorated to the same extent, many of the grasses still struggling against the encroachment of the inferior salsolaceous herbs, and bearing testimony to their wonderful resistance.

Upon the return of good seasons this country would, under judicious management, recuperate within a comparatively short period. The red country, which is so overrun with scrub, would not respond to the beneficial effects of a heavy rainfall until after the scrub was destroyed. Upon the destruction of this scrub the grasses which had not been seen for a number of years have appeared, but not in anything like their original density, the worst grasses predominating, with still more scanty growth of the more valuable varieties. This, if left to seed, would allow of recuperation in a far shorter period than if kept even lightly stocked. In this district, where land had been scrubbed by the Government, a portion was fenced twelve months ago and kept free from stock, one of the adjoining paddocks was lightly stocked with horses and another lightly stocked with sheep. The whole of the area was completely eaten out prior to the fencing. This enclosed portion produced in the early spring a fair amount of herbage, amongst which was *Calotis cuneifolia* or "Bogan flea"—a plant producing a dense head of small spiked seed-vessels, and considered a nuisance amongst sheep, as well as many inferior salt herbs.

During the year a rainfall of 10 inches was recorded—one decidedly below the average.

At the end of the twelve months the unstocked portion produced a moderate amount of about twenty to thirty different varieties of grasses, which had all seeded, as well as numerous herbs. The paddock stocked with horses contained no grass; but the majority of the herbs were left untouched. The paddock stocked with sheep had not matured any grass-seed, and the herbs were also eaten out. Throughout this area the fire-breaks (which are unscrubbed belts of country to prevent the spread of bush-fires) were completely destitute of grasses or herbage upon all three areas. This in itself was a valuable object-lesson upon the advantages of scrubbing, the good effect of complete resting, and the injurious effect of even light stocking in the early stages of improvement, which was more marked in the case of the sheep-paddock than in the one occupied by horses.

In many other instances where the land has been scrubbed and not stocked the improvement is just as noticeable, proving that these lands are not irreclaimable. In some instances, perhaps, the amount of money required for the initial work of improvement, especially upon the sandy areas, would be exceptionally heavy, the scanty nature of the pasture not compensating for the outlay. Upon the other two classes of land this work would, under judicious management, repay the holder.

The principal conditions necessary for the permanent profitable improvement of these areas are that the State offer sufficient inducement to private individuals to occupy these lands under improvement stipulations; that the areas should be kept free from noxious scrubs and animals; a complete resting of the country for the first twelve months after scrubbing, after which period rational stocking with ample subdivisions to allow of what is termed "the alternation of pastures," one portion being rested, say, for three months of the spring to allow the grasses of those months a chance to seed, as also during the summer, autumn, and winter months. This would mean that a paddock would be rested four times within four years at different seasons of the year; such a system would prevent the annihilation of the different grasses, herbs, and saltbushes. And if the system of rotation of stock were practised as well, allowing for horses, cattle, and sheep to be grazed alternately, much would be done to conserve the edible trees and saltbushes, giving them a chance to perpetuate themselves by seedlings; also conservation of water by artesian wells where practicable, and by other methods. A proper system of classification is urgently needed, with a due regard to the nature of the soil, growth of scrub, average rainfall, proximity to railways, &c.; also closer settlement upon areas which are adapted for such by many of the above-mentioned conditions, the lack of the many advantages which such a system brings being a serious drawback at the present time in the Western Division.

A limited portion of this area is perhaps adapted for wheat culture combined with wool-growing, and when cheaper means of marketing agricultural produce are provided a large area could be profitably brought under the plough. That portions of this area may be profitably cultivated may be doubted by the many; but when the rapid strides that have been made in wheat-growing in the arid areas of this Colony and other countries, the marvellous improvements in agricultural machinery, and the wonderful adaptability of the wheat-plant to its surroundings are taken into consideration, it may be wise to take notice

SHOWING HOW THE BOX SEEDLINGS AND SUCKERS TAKE POSSESSION IN THE WEST BOGAN COUNTRY.

A CROP OF OATS AT MILTON,

Growing in a paddock previously manured, in hills, for pumpkins. The pumpkins were a partial failure on account of drought, and the patches of luxuriant oats are the result of the unused manure (*vide* p. 609, last *Gazette*.).

of what has already been done in this respect before forming a too hasty judgment.

At the present time the Western Division is in a lamentable condition, and requires very different treatment upon the return of good seasons than it has had in the past; the many hard-learned lessons should be valuable to the future holders of these lands, who will have a hard fight in bringing them back to a semblance of their former productiveness. That such can be brought about by judicious treatment, in conjunction with the unlimited recuperative powers of the various grasses, &c., in the majority of cases, I am convinced of. These views have been given expression to with the object of calling attention to the present condition of these lands and their possibilities under improvement; such improvement, in the worst cases, must of necessity be slow; but in the interests of the country some scheme should be devised to prevent the further deterioration of the present profitable areas, and to allow of the reclamation of those which have depreciated to the extent of being unprofitable under their present conditions.

THE CATERPILLAR PLAGUE.

EARLY in July reports were received that the caterpillars, which caused great damage to crops and grass last season, had again appeared in the southern districts. The Entomologist accordingly visited Whitton, near Narrandera, to investigate the trouble and see what could be done to prevent further outbreaks of these devastating creatures.

Just before Mr. Froggatt arrived in the district there had been about an inch of rain, and soon after another inch fell, so that a great part of the plains was covered with water for several days. Reaching the infested area it was noticed when crossing over some crab-holey country that the submerged grass was covered with small caterpillars that had crawled up out of the flood, and were then surrounded with water. Any smaller ones and unhatched eggs in this ground were probably destroyed, but on the subsidence of the water these grubs would be none the worse. On the grass lands a considerable number of small, active caterpillars were found. On and around the edges of the crop, however, most of the full-fed caterpillars were dead, or in a diseased condition, in consequence of their being infested with the fungus disease reported last year, and since described by Mr. McAlpine, of Victoria, as a new species. In another paddock, where the crop had been overrun with them, the caterpillars had also succumbed to this disease, and the fencing posts were festooned with the remains of dead ones. In the first stages of this infection, Mr. Froggatt noticed that when an apparently healthy grub was picked up, it was soft and flaccid to the touch, while the healthy ones were firm and solid. In consequence of the early appearance of this fungous disease among the caterpillars during such suitable weather for the propagation of the spores, the Entomologist does not think that this brood of caterpillars will do any harm and the crops will be well advanced before another brood could appear, if any are left. One of the most successful methods to deal with the caterpillars when coming off the grass lands into the crop, is to run a plough furrow outside the cultivated land, and then lay poisoned bran down it, or dig round pot-holes in the furrow at intervals of 20 or 30 yards. The caterpillars always follow the furrow down, and the expense of poisoned bran and furrow would be much less than resowing the paddock, which is often done.

Following is a formula for poisoned bran:—Take half an ounce of Paris green for every pound of bran, and mix thoroughly in a dry state; then dissolve half a pound of sugar in quart of hot water, and mix as for a bran mash, but do not make it too wet, or it will not scatter.

A Plea for our Western Scrub and Saltbushes.

T. E. GRIGG,
Fareham.

THE last few years have been noted for rapid decrease in the amount of available edible scrub, and I think the time has come when we should ask ourselves what are we going to do to replace this most necessary standby for droughty times. To my own knowledge there have been thousands of acres of valuable scrub chopped to the ground which should have been only lopped, so as to give it a chance to recuperate and produce fresh growth. But it is no use crying over spilt milk. What we have to do now is to do our best to replace the scrub. It seems to my mind most necessary for our settlers in the Western Central District to experiment with some of the quick-growing scrubs and trees (like the pepper-tree); we want something that will grow quickly, and produce abundance of foliage. If we take our edible scrubs, we find that some of the best of them will not stand lopping, as, for instance, the whitewood and myall, in nine times out of ten. Leopardwood is another that is fast disappearing. Wilga will stand lopping if lopped high enough to protect the young shoots from stock.

It will serve no purpose to go through the list of scrubs; what we want is something to take the place of those destroyed, for with the country stocked, even as lightly as at present, the young shoots and seedlings get no chance to grow. This, to my mind, is one of the most serious questions that our western settlers have before them. For already it is quite common to hear, "Oh my scrub is cut out. I have been cutting box and budtha, and that is nearly done," and so on. Now, droughts will come again, and for a certainty we shall want scrub again, and it is our duty to prepare for the next drought now. I have given this question many an hour's thought, and the best that I can recommend our settlers to do is, "Look after the scrub while you have it with you." One of the easiest and simplest things to do, when riding through the paddock and you notice a young seedling, is to gather some branches and make a protection for it from the stock. This will only take a few minutes, and the time is well spent. And I must strongly advise settlers to go in for cultivating the "old man" saltbush. If you have a good patch of "old man" anywhere in the paddock, so much the better. Fence it off for a seed-bed and gather as much seed as you can, for it is no bother to take out your pocket full and sow it in the most suitable places when you are riding through the paddocks. Another plan I would recommend is to plant cuttings; but my experience is that you want a drooping season for planting out. But hundreds can be struck in the garden and transplanted at the most favourable opportunity. To my mind there is no tree, scrub, or any member of the saltbush family that can come near the "old man" for a bad season. In good seasons, when feed is plentiful, stock will not trouble the "old man." Then is the time to get seed and cuttings out; plant them along the edge of the swamp and black-soil plains, around the waterholes, and, if possible, throw bushes over them. I have some hundreds of young plants that have done splendidly this last six months. Some of them are strong enough for feeding down without fear of the stock eating the stalk, but it is better to keep stock from them till the second season. I hope our settlers will see the necessity of preserving our native scrub and bushes, for I know of nothing to take their place if we are so careless as to let them be destroyed.

SPRING RUST IN WHEAT CROPS.

THE Wheat Experimentalist has received complaints from farmers to the effect that their wheat crops are becoming very rusty, and asking what is the best thing to do with them.

Mr. Farrer states that no alarm need be felt at the presence of the rust which appears on the foliage at this time of the year (July), as it belongs to a different species to that which later on injures the grain. To reassure the farmers who are becoming alarmed, he places before them what is said in regard to this subject in Carleton's "Cereal Rusts of the United States."

In his discussion of this subject, Mr. Carleton says:—"Certain phenomena observed during the experiments at Garret Park led the writer to think that in very wet seasons this rust may be actually of some benefit to the grain by preventing too much growth of the vegetative parts of the plants at the expense of the reproductive portions. Though many varieties produced shrivelled grain in these experiments, those most seriously affected with this rust produced good grain."

Little, in his discussion of wheat "mildew" in England, also refers to this. He states that in the Fen districts, which suffer most from mildew, the prevalence of spring rust (*Uredo rubigo vera*) is believed to be rather beneficial than otherwise, as it reduces the excessive luxuriance which is usually the result of a mild winter, and which is popularly supposed to make the wheat crops more liable to mildew."

It is the rust which appears in the late spring or early summer on the bare stalks or the part of stem above the highest leaf which injures the grain; and unless rust is seen on this part of the plant no great alarm need be felt. If, however, it is seen on the part of the stem over a fortnight before the crop is expected to ripen, the crop had probably better be cut for hay. The crops in many parts of the Colony—those especially which were shown early in the warmer districts—have become proud, and will have to be eaten down.

Mr. Farrer strongly recommends that this be done before the plants begin to run up, and most certainly before they come into ear; for he has never seen plants do much good afterwards, if they were cut back after they had begun to run up. It may not be out of place, Mr. Farrer thinks, to caution those who make use of sheep for eating down their "proud" crops, to be careful not to allow their crops to be eaten down severely. If it be found desirable, it would be better to eat down partially more than once.

Collar Rot, or Mal di Gomma, of Citrus Trees.

In the citrus districts of New South Wales there are few orchards in which some young lemon, orange, or mandarin trees have not been destroyed by this insidious disease. Sometimes the trees sicken and die within a year of planting out, and sometimes they will grow luxuriantly for several years, when the leaves will lose their dark glossy tint, turn to a sickly yellow, and succumb within the season.

A good deal of information about the disease has already appeared in the *Agricultural Gazette*, and no doubt many orchardists who keep a sharp look out for the symptoms of collar rot, and treat the affected trees as we have recommended, viz., cut away the diseased bark and sapwood with a sharp knife, carefully cover the wound with grafting-wax or Stockholm tar, or apply a dressing of a couple of pounds quick-lime about the diseased part, have been able to save their trees.

In his "Handbook on the Fungus Diseases of Citrus Trees in Australia," published by the Department of Agriculture, Victoria, Mr. D. McAlpine, Government Vegetable Pathologist, has a chapter on "Mal di Gomma." Mr. McAlpine has generously placed the results of his investigations at the disposal of the *Agricultural Gazette*, and it is felt that the following information from his handbook will be studied with interest and profit by the citrus growers of New South Wales:—

Collar-rot or Mal di Gomma (*Fusarium limonis.* Briosi).

This disease being so widespread has naturally a variety of names, and it is necessary to know the principal ones in order to understand the references made to it in various publications. It is commonly called "collar-rot," because it attacks the lower portion of the stem, near the ground, and may either be below or above it. "Foot-rot" has a similar signification, and the common Italian name of *Mal di gomma*, or gum disease, indicates that gumming is a constant accompaniment of the disease. It is sometimes referred to as the fatal "bark disease"; but as several different diseases may be included under this term, it ought to be discarded. It is also known as "sore-shin," and "bark-rot," from the part affected; "the fatal," from its destructive character; and the "Sydney disease," from being so common about Sydney; but the common name with us is "collar-rot." It is, unfortunately, one of the best known of citrus diseases, for it occurs wherever oranges or lemons are grown, often causing serious loss. The first mention of it was in connection with the orange-groves of the Azores, where it seems to have originated, and was noticed as early as 1832. Like many other diseases, it attained its maximum, then began to decline, and about forty years afterwards its force was spent, and it ceased to be regarded as serious.

Meanwhile it spread to Southern Europe, and afterwards appeared in Florida and California. It has now obtained a footing in Australia, and annually causes considerable loss. From the very nature of the disease, which attacks young and old trees alike, and may sometimes "ringbark" them in the course of a few months, entire groves are either destroyed or rendered almost worthless. It is generally spoken of as a mysterious disease, but the discovery of the parasitic fungus causing it has brought it within the domain of rational treatment.

Symptoms.

The disease has often made considerable progress before the grower is aware of its presence, because it begins so low down that it is overlooked. One of the first indications is the exudation of drops of gum at the neck of the tree, and this is so constant that where there is no gumming some other disease is at work. It would appear that the fungus parasite excites the flow of gum for its own convenience, for I found numerous conidia actively germinating in it, and producing filaments at either end or laterally. The gumming may occur at one or more spots, and the bark at the same time becomes discoloured. The browning of the bark is the sign of rotting, which gives rise to a decidedly disagreeable odour, and the bark gradually rots away and is thrown of. If the tree is able to renew the bark and arrest the progress of the disease, further mischief is prevented, but usually the disease runs the following course:—The cambium layer, which lies between the wood and bark, is the formative portion of the stem, giving rise to new wood on the inside and fresh bark on the outside, and containing the necessary elements for building up. The object of the parasite seems to be to reach this treasure-house, and accordingly the decay reaches the cambium layer, and even extends into the wood. When this happens there is no possibility of the renewal of the bark, and that portion is dead. Then the disease spreads further in all directions, principally around the base of the stem and down to the main roots. Gradually the diseased area is extended, the tree is completely girdled, and death ensues. While this is taking place near or beneath the ground, the foliage is affected, and becomes yellow and sickly from the insufficient supply of nourishment from the roots.

The exudation of gum at the collar, the decay of the bark there in patches, and the consequent disagreeable odour, the unhealthy appearance of the foliage, and the death of the small shoots, are all symptoms of this disease.

Mr. Williams, of Doncaster, who has been growing oranges and lemons for a number of years, says that "generally the first visible intimation of the disease is the fruit setting abnormally thick, and the foliage turning a sickly yellow colour." This fruit-setting is an evident effort of the tree to provide successors before it finally perishes.

Effects.

This is regarded as the most destructive of citrus diseases, as it is also one of the most widespread. I have no means of estimating the loss caused by it in Australia, but in Florida the annual damage is calculated to be about £20,000, and in Italy, taking an average of sixteen years, there is a loss of £25,000. Under ordinary circumstances, affected trees gradually die off, but sometimes the wound heals of its own accord. When trees are attacked, they may produce an extra large crop of fruit the first season, but this is usually the expiring effort, and little or none is produced afterwards. In a few months the "ring-barking" of the stem may be almost completed, and, as the disease spreads from tree to tree, in the course of a few years entire orchards may be devastated. The progress of the disease will be rapid or slow according as the conditions favour it or otherwise.

The healthy root action is interfered with, and there is a deficiency of nourishment; the foliage is affected and is unable to assimilate properly; the girding of the stem prevents that free communication between root and leaf which is essential to plant growth; and finally, with the destruction of the cambium layer—the centre of vital activity—the tree is doomed.

Conditions favouring Disease.

The conditions which favour the disease are often confounded with the cause; but we must distinguish between them. There are what may be called predisposing causes—conditions which affect the plant injuriously and render it liable to the attack of the fungus parasite. They may be guilty of aiding and abetting and preparing the way for the fungus, but of themselves do not induce the special disease known as "collar rot." As far as known, it is necessary that this particular fungus invade the weakened tissue in order to produce the characteristic symptoms which we speak of as the disease; and whatever is antagonistic to these conditions, or destructive of this fungus, will tend in the direction of preventing or remedying the disease. Unsuitable soil is said by some to produce the disease, because it always occurs towards the base of the stem, near to or beneath the surface of the soil; but transplanting the trees to similar soil may lead to their recovery. Sudden changes in the temperature of the soil surrounding the stem are also supposed to induce it, the sudden and extreme variations affecting the regular flow of the sap and producing contraction and expansion of the bark.

The want of proper drainage is likewise a contributing condition, because it will prevent the perfect aeration of the roots, and the water may be allowed to lodge round the stems.

Close and deep planting, producing an excess of shade and a deficiency of feeding roots; excessive irrigation, keeping the soil soaked with water; excessive cultivation, which may tend to injure and disturb the roots; and the continuous use of organic fertilisers, are all said to encourage the disease.

Propagation by grafting is also found to render the tree susceptible at the junction of the scion and stock, and, as will be shown more fully later, certain varieties and certain stocks are found to be highly resistant to the disease.

It is very generally stated that the use of lemon stock renders the tree specially liable to this disease; but Mr. Tryon finds that trees on orange stocks are equally liable as far as the Toowoomba district is concerned.

Cause.

The cause of this disease is still in dispute, but the contagious nature of it seems to point to some parasitic organism. In 1878 Briosi described a fungus which he always found accompanying the disease, and named it *Fusarium limonis.* He was inclined to regard it as the cause of the disease, but had not sufficient evidence to prove it. He adds, however: "I do not believe there can be any doubt that its presence accelerates the disorganisation of the tissues, and aids in extending the disease."

I have invariably found the same fungus penetrating the diseased tissues with its long, slender, wandering filaments, and being found here as well as in Italy strengthens the belief that it causes the disease.

The way in which the disease begins in spots and patches, which slowly enlarge, the gradual manner in which it spreads from country to country, and from grove to grove, the fact that transplanting affected trees from crowded situations to more open localities has brought about recovery, and the appearance of the same fungus associated with it in such widely remote countries as Italy and Australia, all point to the conclusion that this fungus parasite is the immediate cause of the disease. Of course, too much moisture around the roots would favour the growth of the fungus, and so trees with "wet feet" would be specially liable to the disease; but it is highly improbable that such a contagious disease, and one which has been checked by the application of fungicides, should be due to some physiological derangement or merely mechanical causes. Dr. Cobb, in his useful *Letters on Diseases of Plants*, refers to a fungus which he found upon the diseased bark of a young orange stock, and which he considered to be a case of apparent "collar rot"; but there was no evidence of gumming, a constant accompaniment of the disease. The fungus is not fully described or named, and drawings only are given; but it is evidently a species of *Phoma.* If an undoubted case of the disease is chosen, the "collar rot" fungus (*Fusarium limonis*) will be found there. The specimen from which the fungus drawings were made was obtained at Doncaster on 28th August, 1896. The effects of the "rot" were visible for at least 6 inches from the ground, and it extended to some of the roots, which were quite dead; but there was nothing to indicate that the disease had started at the roots (as is the opinion of some) and then spread to the stem. The disease had apparently started just beneath the surface, and spread upwards along the stem and downwards along some of the roots.

There is a totally distinct disease, known as "root rot," which is often confounded with "collar rot," commencing at or near the extremities of the roots and proceeding upwards until the tree is killed. The malady is due to quite a different cause, and will be discussed afterwards.

How the Disease may be spread.

If the gum exuding from an affected tree is examined it is found to contain innumerable reproductive bodies of the fungus, or *conidia*, as they are technically termed; and not only so, but these bodies are actively germinating, and so capable of growing on any suitable medium and reproducing a similar fungus to that from which they originated. Suppose a little portion of this gum, containing these *conidia* at the stage when they are ready to germinate, is conveyed by any means to a citrus tree under favourable conditions for the growth of the fungus, then we may expect that the disease will appear. It is thus highly probable that the tools used for purposes of cultivation may carry the germs of the disease from infected to healthy trees, or from diseased to healthy groves. Besides, the gum may act as a preservative for the conidia, and thus prolong their vital activity. During irrigation, gum with conidia might easily be carried from diseased to healthy trees, more especially when the water is allowed to flood up to the trees. It is not maintained that this is the only way in which the disease is spread, but it is sufficiently evident to be worthy of being guarded against.

Varieties affected.

I am not aware that any particular varieties have been specially noted in Australia as being affected with this disease, further than that it has been observed on oranges and lemons; but in Florida the susceptibility of different kinds has been carefully observed. The most susceptible appears to be sweet seedling orange trees (*Citrus aurantium*), and stocks of this used for budding are also liable. Then the lemon (*Citrus limonum*) in all its varieties is very commonly affected, but the Shaddock (*Citrus decumana*) is less liable to the disease than either of the two preceding. Mandarin oranges (*Citrus nobilis*) are only occasionally affected, and the Seville or bitter orange (*Citrus bigaradia*) is the least susceptible of any, being almost entirely free from it. This points to the use of the sour orange as a stock for budding, and Swingle and Webber write:—"The sour (Seville or bitter) orange, used as a stock for budding, remains free from attacks, and in Florida its use for this purpose is almost a sure preventive of the disease." The liability or non-liability to disease is a matter requiring to be tested in different localities, with their varying conditions of soil and climate; so that the order of resistance in Florida does not necessarily imply a similar resistance in Australia. It is to be hoped that experimental tests will settle the best and most suitable varieties to be used in different districts of Australia.

History of Disease in Australia.

In the evidence given by C. Moore, F.L.S., late Director of the Botanic Gardens, Sydney, before the Victorian Royal Commission on Vegetable Products, he stated that this disease was very destructive to the oranges about Sydney as far back as 1867. Then the late Mr. Neilson, Curator of the Royal Horticultural Gardens, Burnley, gave evidence that he had experience in the gardens of what is known as the "Sydney disease," and recommended the following means of dealing with it:—"I have come to the conclusion, as far as I am concerned, personally, that in a great measure it is attributable to deep planting. In planting the orange now, I keep the tap roots upon the surface, and in all that I have set in that method I have never found the slightest symptoms of decay. Another cause I think is in watering—in putting the cold water upon a very hot day close to the bark of the tree; that causes a sudden evaporation, which chills the bark. That is the reason that I assign in a great measure for it. In irrigating the orange tree, water should never go within 3 feet of the bark." Mr. G. W. Knight, nurseryman, at Bendigo, also stated before the Commission that he had an avenue of limes about 14 or 15 feet high entirely destroyed by this disease. He then commenced to grow lemons grafted on the Seville orange to replace these, and they are reported as being healthy, strong, and vigorous, without any evident sign of disease. Mr. E. H. Acres, of Heywood orchard, near Parramatta, experienced this disease some twenty-five or thirty years ago (speaking in 1888), and claims to have checked it. He was asked the question—"There is a disease known in Victoria as the 'Sydney disease' or 'bark rot'; what is the cause of it?" and he replied—"It arises from too much moisture round the roots of the tree; and yet there is such a thing as overdraining the ground. I have seen orchards in which owners have gone to great expense in draining, and have done too much. About twenty-five or thirty years ago I noticed the trees just showed the disease at the surface, and sometimes down the roots. I had been reading something about the effects of lime, and I told one of the men to scrape away the decayed part of the bark and treat it with stone lime, mixed to the consistency of dough. This was done, and it seemed to stop the disease."

Mr. Skene, nurseryman and fruit-grower of the Mildura settlement, who had thirteen years' experience of orange-growing in Florida, and had then been two years at Mildura, attributed this disease chiefly to deep planting, and claimed to have cured many trees by lifting them up, letting the air get round them, and applying some lime.

In Queensland this disease has been known at least as far back as 1876, for the report of a Board appointed to "inquire into the causes of diseases affecting live stock and plants," published in 1876, contains the following:—"The orange family suffer occasionally from a disease of the bark near the root—a gummy secretion exudes and the tree dies. This happens occasionally after a slight bruise from a gardener's tool. The disease has not been carefully examined."

It appears, however, that the disease has not as yet caused much trouble there, for Mr. Corrie states, in his address at the New Zealand Conference of Australasian Fruit-growers that "the very serious bark diseases and forms of collar and root rot which have wrought such devastation in some of the old world groves, so far, have not caused much anxiety in Queensland, and such fungus diseases as exist cannot be said to have interfered with the industry."

Treatment.

This will be based upon a knowledge of the immediate cause of the disease—in this case a fungus—and of those favouring conditions which have been found by experience to predispose or render the trees susceptible.

1. There is a general remedy which has been found applicable to citrus trees affected with diseases due to fungi, and that is to cut away the diseased portion, taking care to remove every trace of it, and, to make sure, a little of the apparently healthy tissue surrounding it as well. This has been found successful in bark diseases generally, and of course every such diseased portion should be burnt. The wound will generally heal, and the further progress of the disease be stayed.
2. In order to prevent infection from stray conidia, or from filaments of the fungus which may still be in the surrounding tissue without external signs, some antiseptic solution should be used to dress the wound.

(*a*) Mr. W. S. Williams has found that painting with *carbolic and olive oil*, mixed in equal proportions, will prevent any further extension of the disease.

As the result of the Florida experiments, the following solutions are also recommended:—

(*b*) *Sulphurous acid* in the proportion of 15 to 85 parts of water. This may be used to wash or paint the wound, or it may be sprayed on the exposed roots.

(*c*) *Carbolic acid*, in the proportion of 1 part of crude acid to 1 part of water. This may be used to paint the wound or sprayed on the roots when diluted in the proportion of 1 to 5.

(*d*) *Sulphur wash.* This is a generally useful preparation, and consists of flowers of sulphur and caustic soda. To make a stock solution, place 30 lb. of flowers of sulphur in a wooden vessel and mix it with sufficient water (about 12 quarts) to make a stiff paste. Add to this 20 lb. of finely powdered caustic soda, and mix thoroughly by vigorous stirring. The mass becomes hot, turns brown, boils, and liquefies in a few moments. When the violent boiling has ceased, add water to bring it up to 20 gallons, and strain into a barrel, which can be kept tightly corked.

Formula—Flowers of sulphur...	30 lb.
Caustic soda (NaHO)	20 lb.
Water	20 gallons.

For covering wounds, 1 part of this stock solution is to be added to 1 part of water, and for spraying the roots 1 part to 10 parts of water. Even coal tar has been used as a dressing.

3. As imperfect drainage prevents the proper aeration of the soil, and as this seems to favour the development of the fungus, the removal of the soil and the *exposure of the roots* to the air will often of itself prove effectual. In removing the soil, care should be taken not to injure the healthy roots, and a few pounds of slacked lime might be applied.

Proper drainage of the soil is thus a good preventive of the disease.

4. As highly *nitrogenous organic manures* seem to encourage the fungus or predispose the tree to its attacks, avoid them.

5. Avoid *close planting*, as the excessive shade thus produced is favourable to the fungus, apart from its injurious effect upon the trees.

6. *Transplanting* badly affected trees and giving them plenty of room has also been found beneficial.

7. Avoid *deep ploughing* close to the tree, as the roots are thereby often injured, and the entrance of the parasitic fungus encouraged.

8. It has been found, as a matter of practical experience, that *budded plants* are less liable to the disease than grafted ones. The union of stock and scion in a graft is nearer the base where it is liable to be attacked than in budded plants, and the disease often occurs just at the junction. Besides, budding makes a firmer union with the stock, and is both easier and quicker. Therefore, budded are to be preferred to grafted trees, and layering seems to be best of all.

9. Generally speaking, whatever encourages the healthy growth of the trees should be attended to, and whatever weakens their vitality should be avoided. As citrus trees are very sensitive to water lodging at the roots, irrigation should be used in moderation, and if water is allowed to flood the whole surface, the germs of the disease may readily be transferred from one tree to another, and the drainage should be good in order to provide for the perfect aeration and the equalisation of the temperature of the soil. Deep planting and deep cultivation should be avoided, and too close planting prevents the free access of light and the proper development of feeding roots.

In order to get the best possible local experience, I addressed a few questions to one of our most successful citrus-growers in the Doncaster district, Mr. F. Finger, and in returning the answers he made the following remark—" With regard to the 'collar rot,' I have been very lucky. I have not lost one tree with it yet, although I have had several affected, but they grew out of it. My oldest trees are on sweet orange stocks, and a lot of my younger ones are on bitter orange stocks. I have none on lemon stocks. I plant only layers now, as they have no union, and they are not so liable to get the 'collar rot'; in fact, I have never seen any signs of the disease on them yet. They grow much quicker and bear finer fruit than seedlings."

The questions and answers are here given :—

1. At what age have you found trees attacked ?—I have seen trees two years from the nursery affected and die from the " collar rot."

2. Is the lemon more liable to the disease than the orange?—From my experience, in what I have seen the lemon stock is most decidedly more subject to the disease.

3. Do affected trees bear an abnormal amount of fruit the first season?—Yes, they do, and that is a pretty sure sign of the disease if the tree is about five or six years old.

4. Do you approve of the lemon stock for oranges? I, myself, would rather have lemon on lemon and orange on orange stocks. It depends on the climate and soil.

5. What is your opinion of the bitter orange stock as a preventive against "collar rot"?—I don't think it is as good as the sweet orange.

6. Have you had sufficient experience of layering to say if it will have any effect on "collar rot"? I have never seen a sign of "collar rot" on layers, but they might get it in favourable places.

7. Some say that they do not like layering as well as working on seedlings;—what is your opinion? I intend in future to plant only layers.

8. Is there any other information you wish to give?—The main point is to have good drainage, and don't plant the trees too deep, and keep plenty of moisture around them in summer time.

As regards layering, opinions are much divided, and it has been stated that layering has been abandoned in New South Wales owing to such trees being subject to collar-rot. [The experience of growers on this point would be of much interest.]

RAISING TOMATO PLANTS.

In an answer to a correspondent who desires information how to raise 100,000 tomato plants for a canning factory, the *American Agriculturist* says: "If planted in rows 5 feet apart and 3 feet in the rows, which is about the proper distance, it will require about 3,000 plants per acre. One ounce of tomato seed contains from 8,000 to 11,000 seeds, but of course it is not safe to count upon the growing of every seed, and producing a good, healthy plant. Truck farmers generally sow about ¼ lb. of seed per acre to be planted. For early fruiting it is necessary to sow the seed in hotbeds or greenhouses and transplant the young plants from time to time as they become too crowded. But as for canning purposes extreme earliness is not of prime importance, the seed may be sown in the open ground in a warm and sheltered border where the young plants may be covered with hay or some other light material in case of late frosts. Some large growers have been quite successful with planting the seeds direct in the field, but this is only practicable on light and warm soil."

Maize-growing in New England.

T. ARKINSTALL,
Hawkesbury Farm, Armidale.

As New England is not considered good maize-growing country, and crops are often a failure there, a short article on the subject may be useful to table-land farmers. The writer has grown maize every year since 1891 without a single failure, and has won several prizes at local shows, and only this year won every prize offered.

The best kind of soil is a deep black, if the drainage is good, but good red or chocolate soil will grow good crops and the best quality of grain, and is more easily worked than black soil and easier to keep clean. The land should be well ploughed 6 inches deep or more during the winter and left to crumble; in the latter part of August or early in September it should be ploughed again the opposite way. The best time to sow is from the middle of September to the middle of October for the larger kinds, and a week later for small kinds. If the ground is moist enough drill the ground 4 feet between drills, then cross-drill 3 ft. 6 in.; this can be done with a two-horse cultivator with a furrower on each tine set the proper distance. Plant two good plump grains where the drills cross and cover with light harrows. The drills should be 4 inches deep in black soil and 5 inches in red. Cross-drilling will make the rows straight both ways, which saves hand-hoeing. If weeds show before the corn run the harrows over it, but if the corn shows up all right in about three weeks run a horse-hoe through the 4 feet way pretty deep and about a week later the opposite way, deep also. This will kill every weed and give the corn a good start. When it is about a foot high send the scarifier through it again, shallower this time. It will keep the weeds from growing if the weather is moist, and if dry it will close the cracks and keep the moisture in. Keep it well scarified up to cobbing time and perfectly clean. It will then take care of itself and produce a good crop in dry seasons on black soil and a fair crop on red soil. When the corn is ripe enough, which it should be about the end of April, the best and quickest way is to leave the husk on the stalk. This saves once handling, and it can be put away with safety and left until shelling time without risk of going mouldy, which it does in moist seasons if left too long in the husk. You require less room and make no litter with the husks, and you carry one-third more in a load and the stalks burn better with the husks left on them.

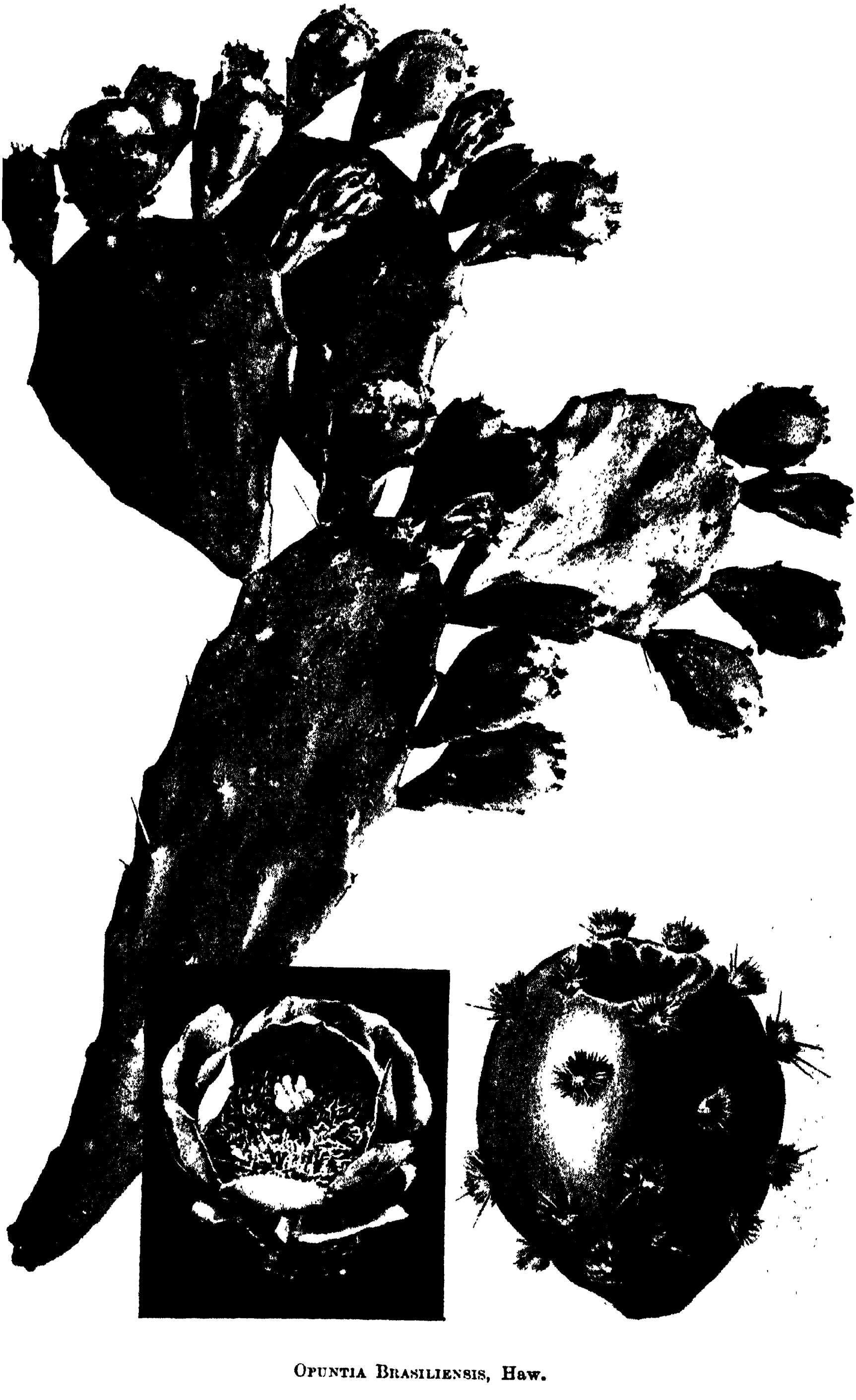
My shed is 42 feet by 16 feet outside measure, and 11 feet to the eaves. There is a bin at each end 15 by 15 feet in clear, built of saplings with a floor of slabs; this gives plenty of ventilation. There is a 10 feet space between bins for shelling in and holding the shelled corn, and also a 10 feet lean-to on three sides; this keeps driving rain off and is handy to keep dray and buggy under cover, also stables and stalls for horses. Each bin will hold 100 bushels for every foot deep. Mine are 7 feet, but they can be built up to 10 feet, the shed will then hold 2,000 bushels in the cob. These bins can also be used for wheat sheaves from December to April, and cleared out in time for next crop of corn.

Many farmers hill their corn and remove the suckers. Both operations are a mistake, hilling in particular. It is horse-killing work, and does more harm than good. Suckers do no harm, and in good seasons have cobs on. I remove them in dry seasons, not from choice, only to keep stock alive, and I am certain that the time spent in removing suckers can be more profitably employed removing weeds. I have grown as high as 80 bushels per acre in good seasons, and in one instance I got 53 bushels from 6 chains—nearly 90 bushels per acre; and I never get less than 40 bushels on black soil if it has been kept clean and well worked. I have averaged over 40 bushels for three years, or about £6 10s. per acre, one year with another, or about three times the return from an acre of wheat giving 25 bushels per acre. It is useless to grow the very large kinds of corn. Yellow Hogan or Hawkesbury Champion will grow if above the ground the first week in October, otherwise they will not ripen.

A REMEDY FOR CRACKED HEEL.

HORSES' heels, says a writer in *The Cable*, are like men's hands. Some men's hands chap readily on exposure to cold or wind; so some horses' heels crack when exposed to wet or mud. In such a case the only real preventive is to keep them out of the mud; but as that cannot be done, the next best thing is to clip off the long hair, so that the mud can be washed off easily with warm water, and the legs rubbed dry with a cloth at night. If sore or inclined to crack, a veterinary, with an extensive practice, recommends carbolised raw linseed oil, applied freely with a bandage at night.

There are considerable objections to the clipping of the naturally long hair of the fetlocks of heavy horses. If the feet are carefully attended to, and in wet weather after the legs have been washed and dried some vaseline or cart grease is well rubbed in, the skin of the heels will not be likely to crack.



Opuntia Brasiliensis, Haw.

Analyses of Prickly Pear.

F. B. GUTHRIE.

It is thought that the following analyses of prickly-pear may be of interest at the present time.

The best method of dealing with the plant is a question of some importance, for it has established itself in many districts and has become a serious pest, whose eradication is a matter of considerable difficulty and expense. It thrives alike on the poorest soil in the dry country and on the richest lands of the Colony, and has become a serious nuisance to squatters all over New South Wales and Queensland.

The following information concerning the steps taken by the Government to eradicate the pest was kindly supplied to me by Mr. J. E. Davies, of the Forest Branch, Department of Lands, the officer administering the Prickly-pear Destruction Act:—

Prickly-pear Destruction.

"The work of administering the Prickly-pear Destruction Act of 1886 is entrusted to the Forest Branch, Department of Lands, and the most important sections dealt with are the leasing and clearing of infested Crown lands and the enforcement of clearing conditions on private lands within the Colony.

"The total cost of administration since the passing of the Act does not exceed £7,000, of which fully two-thirds have been expended in clearing Crown lands; but this expenditure has been more than recouped from the annual rents received from prickly-pear leases.

"Incidental to this, it may be mentioned that the cost of inspection, which is performed by foresters and conditional purchase inspectors and inspectors of stock, in conjunction with their other duties, does not cost the Government one penny.

"At the present time there are some 47,868 acres under lease, yielding an annual rental of £560 7s. 10d., or, roughly, £7 10s. per section of 640 acres. The results obtainable under these leases are highly satisfactory, inasmuch as the destruction of the pest is a condition of the lease, and while further expanse is checked a fair rental for the land is at the same time secured.

"During the past twelve months action has also been taken to destroy prickly-pear on several important stock routes, and an expenditure amounting to £842 has been incurred; the work in some instances has been completed, and in others proceeding.

Settled Districts.

"Thousands of notices to eradicate 'pear' have been served upon private owners, resulting in many instances in the complete extermination of the pest, while in other cases (with few exceptions) satisfactory endeavours to cope with it have been made.

Outlying Districts.

"In these localities, particularly the north-west, little progress has been made in pear destruction. The cost of clearing this land, varying as it does from £1 to £10 per acre in places, together with incomplete supervision and the difficulty of enforcing the Act, also the size of the holdings, intersected in many instances by Crown reserves upon which no expenditure is incurred in eradicating the pest, adds considerably to the difficulties of administration, and in the meantime the pear is rapidly spreading.

"To enforce the conditions in their entirety under these circumstances would mean absolute ruin to numerous settlers, and until some cheaper method than that now in vogue is discovered for destroying prickly-pear, the aim of the Department is to check as far as possible further expanse on private lands.

"The plant is peculiar on account of its intense vitality and provisions for propagation. Not alone is it a heavy seeder, but almost any fragment of the leaf will grow, and that under the most forbidding circumstances.

"It thrives on very poor soil, and in many places the scrub on the rocky hill-sides is so heavily infested, and the infested areas so covered with seeds that from year to year have been deposited, that it seems doubtful if ever they can be thoroughly eradicated—certainly not without years of patient care and expenditure.

"One of the worst features is that the poor land when cleared from the pears is of little use for settlement, and in very many cases there can be no hope of the Crown being recouped by any added value to the land in the event of it being cleared at the public expense.

"Experiments have been made at different periods with fluids of several strengths sprayed upon the plants, but with far from satisfactory results; and unless some cheaper and more effective means is found, other than the digging up and the burying, the ultimate cost of clearing the Crown lands will entail upon the Crown an expenditure of over £100,000.

"Several instances have been brought under the notice of the Department of the leaves and roots being manufactured into fodder, but only on a very small scale; and until more definite tests have been made as to its suitability it would be invidious to express an opinion.

"In conclusion, it cannot be gainsaid that the question of the future eradication of this noxious growth is a matter of national importance, for the pest is ever expanding; and unless immediate action is taken to check this expanse, many thousands of acres of good land will soon become worthless, and the ultimate cost doubled."

Prickly-pear as Fodder.

Having regard to the enormous difficulty of exterminating the pest, it is interesting to note suggestions that have been made for utilising it. Several suggestions have been made for converting it into fodder, and a glance at the analyses attached show that its feeding value is fairly high, and it would be an excellent fodder-plant if it were not for the bundles of fine spikes and hairs all over the leaves.

The analyses, herewith presented, will give some idea of the position of this plant as a fodder. The specimens examined were kindly supplied to me by Mr. J. H. Maiden, Government Botanist, and were grown in the Botanic Gardens. The botanical names were also supplied by Mr. Maiden. The analyses were made of the leaves only. A full description of these plants, from a botanical point of view, will be found in the *Agricultural Gazette*, vol. ix, page 979–1008, from the pen of Mr. Maiden.

Analysis of Fresh Leaves.

	Water.	Ash.	Fibre.	Oil.	Albumenoids.	Carbohydrates.	Nutrient value.	Albumenoid ratio.
1. Opuntia Ficus Indica.	93·76	1·22	0·55	0·35	0·50	3·62	5	1 to 9
2. Opuntia Elatior ...	89·76	1·92	1·39	0·35	0·65	5·93	7½	1 to 9
3. Opuntia Brasiliensis...	86·19	2·43	1·51	0·46	0·90	8·51	10½	1 to 10
4. Opuntia Coccinellifera	87·89	1·73	0·96	0·34	0·78	8·30	10	1 to 12

CALCULATED TO DRY SUBSTANCE.

	Ash.	Fibre.	Oil.	Albumenoids.	Carbohydrates.
1. Opuntia Ficus Indica ...	19·55	8·81	5·61	8·01	58·02
2. Opuntia Elatior	18·75	13·48	3·31	6·34	58·12
3. Opuntia Brasiliensis ...	17·60	10·93	3·33	6·52	61·62
4. Opuntia Coccinellifera ...	14·28	7·92	2·89	6·44	68·47

The average composition of prickly-pear, as determined by the above analyses, is not dissimilar to that of turnips, an analysis of which vegetable, by Professor Church, is appended for the sake of comparison.

Composition of White Turnips.

Water	92·8
Albumenoids	0·5
Carbohydrates	4·0
Oil	0·1
Fibre	1·8
Ash	0·8
	100
Nutrient value	4

Albumenoid ratio 1 to 6.

Of the successful attempts which have been recorded locally to manufacture a fodder from this plant, the following have been published in the *Agricultural Gazette* :—

Mr. Gorus, vol. vii, p. 658, and Mr. Boyce (Lochinvar), vol. viii, p. 260, give details of the methods adopted by them to prepare fodder by boiling the pear with water. Mr. Boyce also describes (vol. viii, p. 504) his method of preparing ensilage from the prickly-pear. The spines are softened in the process, and the ensilage is much relished by cattle. Mr. Boyce has fed it with marked success to dairy cattle.

Mr. O'Shea (Singleton), *Agricultural Gazette*, vol. viii, p. 434, goes so far as to complain that the Government are doing wrong in ordering the destruction of the plant. Mr. O'Shea's process consists of boiling the pear with water and mixing with bran.

Recently Mr. Ryan, of Wollongong, has taken the matter up, and, according to a paragraph appearing in a recent issue of the *Stock and Station Journal*, is able to convert it into a good fodder at 12s. 6d. per ton. I have made an analysis of Mr. Ryan's product. It is of good feeding-value, and is very similar in constitution to ordinary dry fodder made from rye, sorghum, &c.

The analyses given above refer to the leaves only. The fruit of the prickly-pear have an even higher food-value in the fresh state, as they contain less water. In this connection attention is drawn to an interesting article by M. Paul Bourde, of the Department of Agriculture, Tunis, a translation of which was contributed by Mr. Maiden to the New South Wales *Agricultural Gazette*, vol. vii, page 651. This article discusses the value of the fruit as feed.

Analyses of the fruit made by Wolff, the German chemist, are quoted:—

Analysis of Fruit of Prickly-pear.

Dry substance	21·6
Liqueous matter	3·7
Proteid substances	0·59
Fatty bodies	1·80
Sugar	14·00

In order to compare this with the analyses of the leaves given above, the figures may be presented as follows:—

Water	78·40
Ash	1·51
Fibre	3·70
Oil	1·80
Albumenoids	0·59
Carbohydrates	14 00

or calculated to dry substance:—

Ash	7·0
Fibre	17·0
Oil	8·3
Albumenoids	2·7
Carbohydrates (sugar)	65·0
	100·0

If this is compared with the analyses of leaves similarly calculated to dry substance, it will be seen that the fruit contain in the dry state proportionately more fibre and less nutritious substances than the leaves, and are consequently of less value as fodder.

Notes on the Damage done to Wheat-crops by the late Frosts in the Spring of 1899.

By W. FARRER.

It is difficult to arrive at definite conclusions in regard to the damage which was done by the late frosts which occurred last spring in many parts of the Colony, because the information—the number of cases in which farmers were kind enough to furnish particulars—is too scanty.

(1.) The only one of the cases in which the damage which was reported could have been done by nothing but frost is that which was furnished by Mr. Hatcher, of Oakwood, Inverell. This gentleman reports that "only heads which were out or within a week of coming out were entirely destroyed, and in a few days turned quite yellow from the ground to top of head." Further on he mentions that the crop, in the case of certain parts which at first seemed to have received no damage from the frost "went down flat," and that the frost seemed to have weakened the straw just above the ground. In his description of the weather with which the damage was associated Mr. Hatcher says, "The whole of September was remarkably mild, the glass averaging 70 degrees indoors, and 292 points of rain fell here during the month. On the 30th we had almost a gale from the south-west, which continued nearly all night very cold with like snow-clouds; October 1st, heavy frost; October 2nd, ice on the water killed all early wheat; October 3rd, another frost destroyed most of the vine and fruit crops." In this case there can be no doubt that the damage was done by frost; for all the effects which might be expected from it under the circumstances actually followed. The unseasonable and severe frosts caught the plants full of sap and with tissues quite soft in consequence of the rapid growth they had just been making. The sap was frozen and made to rupture the soft tissues, with the result that in those places where the frost was the worst the parts of the plants which were above the ground were destroyed, and that in the places where it was less severe sufficient rupturing of the tissues occurred near the ground to weaken the straw and cause it to be unable to support the heads when they contained grain. Such a case as this is probably quite exceptional, and only likely to recur at rare intervals.

(2.) In almost all the cases reported the only damage which was observed was that the heads were found to have either set little grain or to be quite empty. In these cases not light frosts only but cold winds following exceptionally warm spring weather would appear to be competent to cause the damage. I am led to think that this is the case by the fact that at the time when the cold weather occurred in this part of the Colony we had no frosts in the neighbourhood of Lambrigg, but snow on the hills, from which strong and very cold winds blew down the valley of the Murrumbidgee. A neighbour whose crop was situated about 2½ miles from my own had to cut it for hay because the heads contained so little grain; while my own experimental wheats, although there were in them varieties representing probably all the degrees of hardiness which are found in wheats, as well as widely differing times of maturity, were not injured at all, although some of the early sorts were in flower at the time. The only difference that I could detect between the conditions which surrounded my neighbour's crop and my own, which would account for his crop suffering and my own escaping, was that the wind from the snow-covered hills came over a long stretch of ring-barked country before it struck his crop, whereas my own was protected by a good belt of live timber. The injury to my neighbour's crop could not have been caused by frost, for it was too windy at the time for frosts to occur. From the inquiries, also, that I have made from those who have reported that their crops were injured in this manner I am led to think that, in most of the cases, the absence of protection from cold winds would be competent to account for the damage. That cold winds coming after mild spring weather are liable to cause damage of this character—failure to set fruit—is shown by the fact that some fruits, especially certain varieties of the grape, such as the Muscat of Alexandria, suffer in this identical manner, and fail to set fruit if they are caught by cold winds when they are in flower. I believe that the wheat-crops on the plains of Monaro often fail, either partially or entirely, to produce crops of grain; and the damage is, I believe, attributed there, in all cases, to late spring frosts; but I strongly suspect that the mischief is not seldom due to cold winds. It is highly probable that varieties of wheat are like varieties of fruits in differing widely in the degree of their liability to injury from this cause. In connection with this subject I cannot refrain from expressing an opinion that the wholesale destruction of timber by ring-barking which is taking place has already affected and in the future is bound to affect disastrously the wheat-growing industry, not so much, probably, by exposing the crops to chill by cold winds in the late spring—for the cold we had last spring was exceptional and caused so much damage because it came after exceptionally warm weather—but to hot winds in the early summer, which ripen the grain before it has grown to its full size, and to violent wind-storms. In some parts of the Colony, indeed, there are already few farms which would not be greatly benefited by the judicious planting of belts of timber.

(3.) Some of the reports have attributed the tip-withering of heads to the late frosts. My own experience of this injury is not small, and in all cases which have come under my notice I have had no difficulty in seeing that dryness of the soil had been the cause of it. In some of the cases, however, which were reported rain is said to have fallen in fair quantity in the early spring; but in none of them was the fall more than sufficient to wet the surface-soil. If in these cases the subsoil had been ordinarily moist—had held the usual reserve of moisture for the summer—these rains would have done much good;

but with the subsoil dry, as it had then become by the drought which had prevailed for so long, they probably did more harm than good; for they caused the wheat-plants to grow rapidly and to stool freely and produce a greater number of heads than the dry state of the subsoil enabled them to fill with grain when the surface-soil had lost its moisture. Hence followed the failure to fill the heads with grain—the tip-withering, in fact.

FERTILITY IN STREET SWEEPINGS.

RECENT analyses by the United States Department of Agriculture indicate great variation in the fertilising value of street sweepings. Estimating nitrogen at 5d. per lb., and disregarding the small amount of phosphoric acid and potash, the poorest sample analysed was worth 1s. 5d. per ton, and the highest was about 6s. per ton. So far as the fertilising value goes, the average would not be great, but gardeners declare that the material is very useful for improving the mechanical condition of stiff and compact soils. It would also increase the power of light soils to hold moisture.

Prices at which street sweepings are sold to farmers vary in reports from sixteen cities from 8d. to 8s. per ton. In some places the entire sweepings are disposed of on contract for a fixed price. Expense of hauling is reduced by spreading the sweepings in thin layers and allowing them to dry a day or two before hauling, and it is thought not much nitrogen would be lost by this plan unless the exposure be continued too long or during heavy rains.

No doubt the street sweepings in American cities where the paving is also of wood are very much the same as the sweepings here—horse droppings and sand used to prevent slipping. Such material should not be applied to the soil direct except in a wet season. Turned under in spring it would in all probability on account of its extreme dryness not become incorporated with the soil very readily, and would tend to fire-fang in clods and keep the ground open during the hot season. To get the best results from such manure, it should be composted with layers of moist earth, and be turned and wetted with slops, &c., two or three times before application to the soil. As a mulch it may serve some good purpose, but if applied dry, and just as it is carried from the truck, a good deal of it will be blown away, and the rest will not be very effective in retaining moisture about the tree.

Properly treated it is an excellent manure for clay lands, and not an ounce should be wasted. Moreover, as it is for the most part produced by hard-fed horses, there is little risk of introducing weeds with it; though it must be confessed in some samples of so-called oaten chaff it is possible to detect seeds of many varieties of weeds.

Some Selected Melons and Notes Thereon.

By H. V. JACKSON,

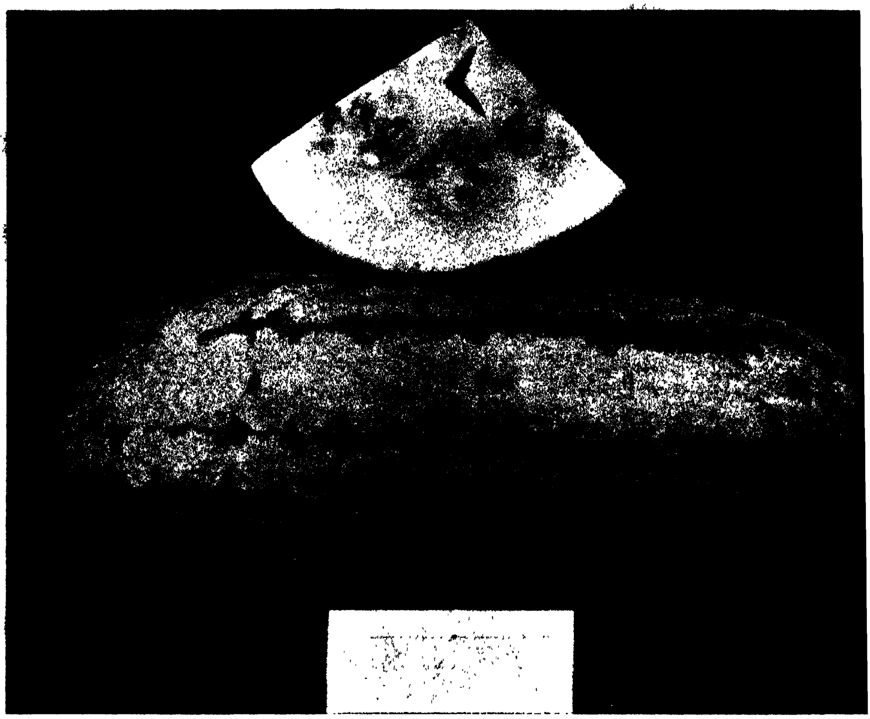
Wollongbar.

The Water-melon (*Citrullus vulgaris*) is a plant thriving to perfection in warm regions, and therefore grows excellently in most parts of this district. It does well in light or sandy soil so long as there is sufficient moisture. In heavy or dense land it is advisable to thoroughly plough the area intended for melons, and by the addition of farm manure the soil will become more free, besides being enriched. In the lighter soils, however, the manure is best only on the surface, for the simple reason that if much manure is added, and a dry time should supervene, then the conditions will not be favourable to the plant unless water can be supplied by artificial means. If the light sandy soil must of necessity be manured below the surface dig the hole fairly deep, place the very well-rotted material mixed with soil at the bottom, so that there is a good layer of unmanured soil on the top. Frosts are injurious, and very prolonged wet weather is unfavourable to the best results.

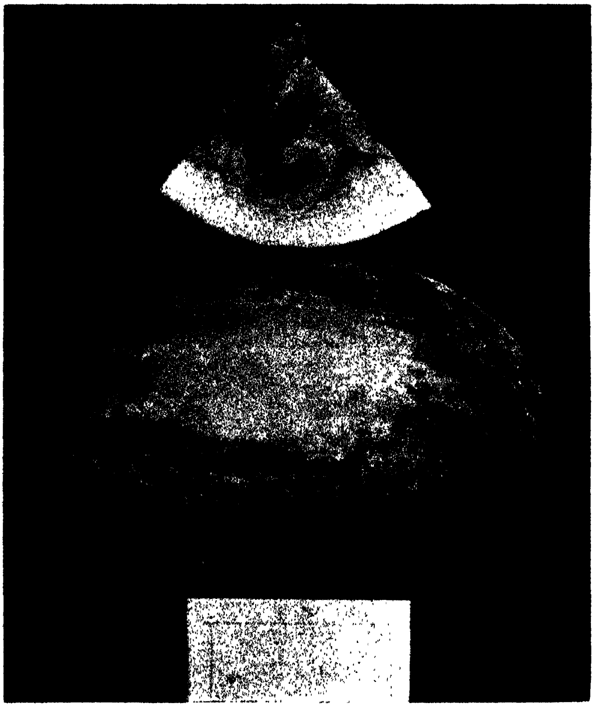
If the season is particularly mild, seed may be sown in the latter part of September and during October. Last season I had some of the melons sown in September; but a frost was experienced in the first week of October.

In the event of frost endangering the young plants, the best thing to do is to water them very early in the morning before the sun has attained sufficient power to dispel the frost. Many of the leaves may be blackened, but if the frost has not been altogether too severe, the life of the plants will probably be saved by this means.

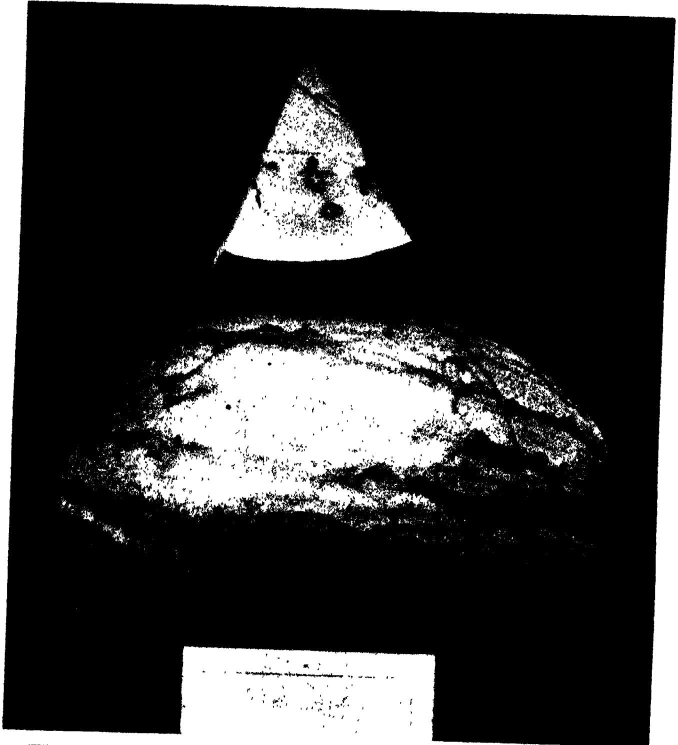
The seeds are generally planted in "hills" or "places" laid off 6 feet or 8 feet apart. I have had as few as four seeds sown in a place, but where you are not pinched for seed, as many as eight may be sown ; it is advisable to have a few extra plants in a place to allow for losses from various causes. If there are only slight losses, or none at all, then at the first hoeing the number of plants is reduced to (say) three, and a little later, if all is going well and the plants are vigorous, two only need be left. If well rotted manure, or stuff from a compost heap, has been thoroughly mixed with the soil at the places where sowing is intended, then before sowing put a layer of fine soil only over the place and sow the seed therein, where the seed will germinate and as its rootlets make a downward course they will reach the richer feeding ground below. This minimises the possibility of losses which are frequently brought about through planting flower and other seeds directly in soil that has been most carefully prepared with a quantity of manure containing much ammonia and giving out considerable



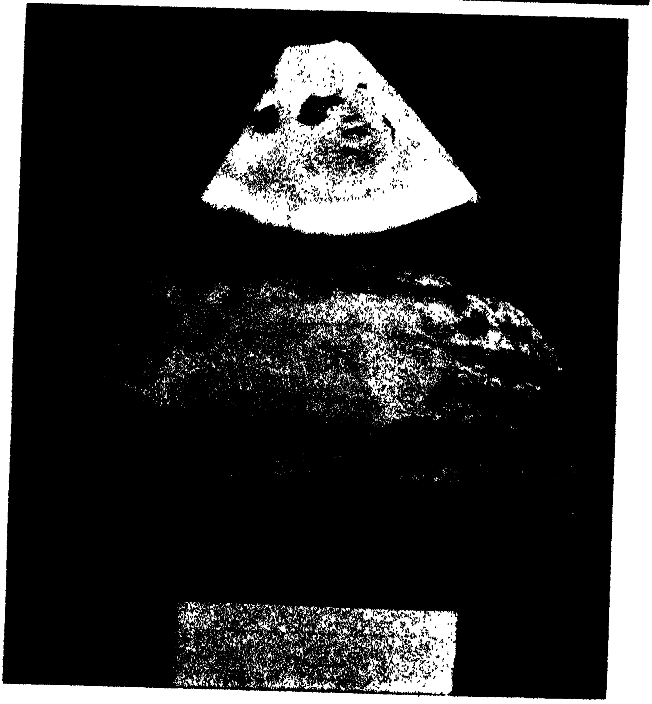
Mammoth Ironclad.



American
Champion.

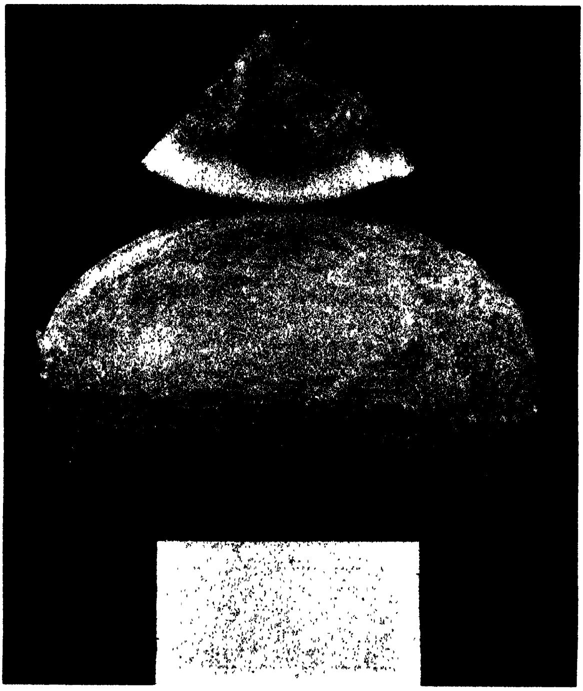


Cuban Queen.

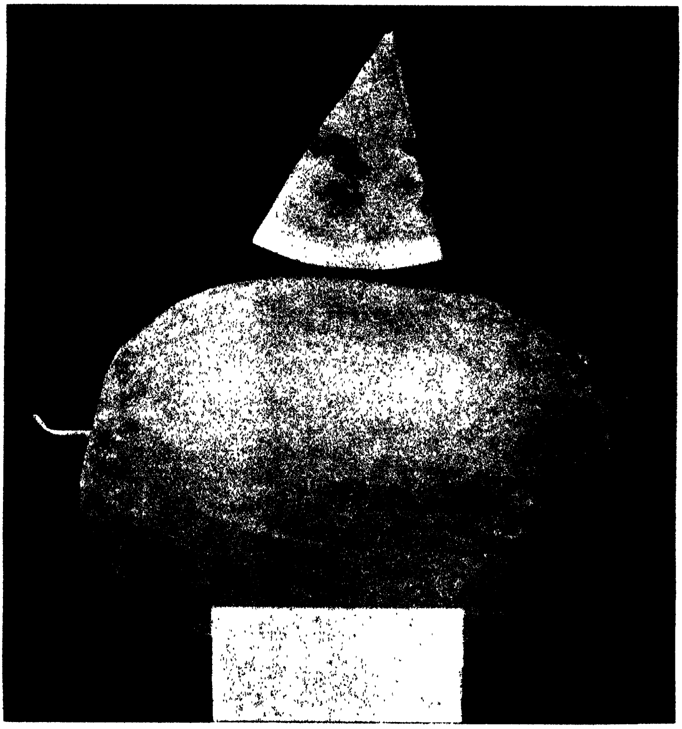


Kolb's Gem.

WATERMELONS.



Ice Cream.



Red-seeded Sugar.

WATERMELONS.

heat. The "hill" or "place" should be made broad and flat, with a slight rise to the centre.

In a large area the Planet Jr. cultivator should be used to keep the soil free and clear of weeds between the rows of hills, until the growth of the vine precludes such work being continued. On small areas, where a horse implement cannot be used, ordinary hoeing is necessary.

The vines as they grow should be pinched back in order to encourage the formation of plenty of cover on the "hill" around and over the roots as a protection from drying wind and scorching sun.

The losses mentioned as being possible arise through the depredations of insects, from severe hail-storms and heavy continued rain, also from fungus diseases which arise in a humid atmosphere following extra moist conditions, such fungus diseases attacking the stem of the plant just above the ground or settling on the foliage.

The insects mostly to be contended with here are leaf-eating beetles—*Aulocophora hilaris*, a black and reddish-yellow beetle, and the *Epilachna punctata* or 28-spotted lady-bird. The remedy adopted here is to dust the vines, per medium of a bellows, with fine lime or wood ashes early in the morning when the foliage may be somewhat damp with dew. Frequent visits to the "hills," doing a little hoeing, and examining the plants for these enemies, keeps them on the move and so prevents too serious an inroad upon the foliage of any one plant.

In low-lying ground, the under drainage of which may be indifferent, especially in a wet time, young plants of cucumber and melon may "damp off." The foliage wilts and an examination of the stem shows a discoloured and an apparently soft or pulpy diseased condition. Massee, in his work on "Plant Diseases," says the disease is attributed to a genus of fungus under the name of *Pythium*, from the Greek word *Pytho*—"I cause to putrefy." There are a number of species, all of which are parasites in the interior of plants. Remedies are hardly to be found; drainage and sunshine are the best check, and the destruction by fire of diseased plants. The same writer says the cucumber and melon mildew, *Peronospora cubensis*, forms a very delicate white mould on the leaves, warm muggy weather being particularly favourable to the spread of the zoospores to neighbouring plants. It is known in the United States, and often proves very destructive if allowed to run its course unchecked.

Mildew of various kinds are included as species under the genus *Oïdium*; but they are known to be merely a stage in development of more highly developed fungi belonging to *Erisypheæ*. Mildew or *Oïdium* may be checked by spraying with dilute Bordeaux mixture. The spray should be directed under as well as over the leaves, and where the plants have died, all trash and roots should be burnt, and no plants of a similar nature planted in the same ground until there has been a rotation of other crops. Another remedy is to dust with sulphur, per medium of the sulphur bellows, both the upper and under surface of the leaves.

Water-melons should be marketed when ripe. To become adept at judging when such fruit is ripe, compare the appearance, feeling, and sound between a really unripe melon and one apparently ripe in your opinion. Cut them both open for comparison. The colour of the skin of a ripe melon is not so bright as while growing; upon handling the melon that is not ripe, the rind will have a more pliable feeling than the ripe melon; the rind of the ripe melon will feel hard in comparison, and the ripe melon, when smartly struck with the fingers, will give an entirely different sound to one unripe. Practice alone will enable you to acquire knowledge of the difference in sound. When the water-melon is ripe, some judge by the appearance of the curl of the stem, which becomes dry; but this is not an infallible test, as some other influence may have caused the vine to perish before the fruit was really ripe. Water-melons required for seed may be left in the field until fully ripe.

If intended to be saved for seed true to name, they should be grown apart in order to avoid crossing varieties.

As to the gardener's or seedsman's named varieties, there are leading old, well-known water-melons that appear in every catalogue. At the same time, if you have a collection of catalogues from Home and Abroad, the list of differently named water-melons will be found to be very lengthy.

I had a very fine collection of water-melons growing at Wollongbar last season from seed obtained from Colonial and American seedsmen. They were carefully labelled and kept true to name, so far as the naming went as given by the seedsman; the fruits were carefully compared as to quality; and in order to, if possible, make some record for identification, the illustrations annexed were made, showing a sectional cut taken from each particular melon at the time.

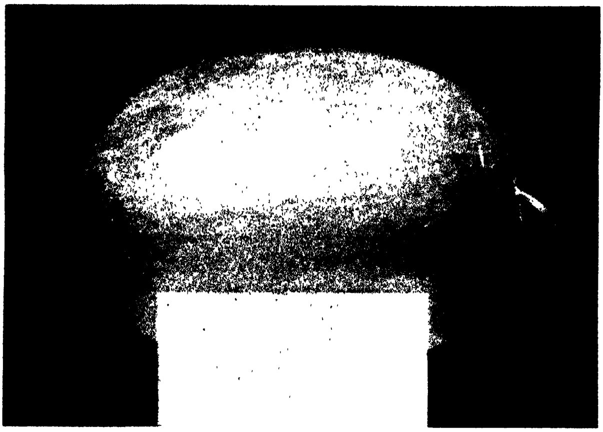
Mammoth Ironclad.—A very fine melon, oblong; the skin of a mottled green; the flesh deep red in colour and firm in texture, sugary in flavour; a heavy cropper; seed white; a good marketable melon.

American Champion.—An excellent melon of delicious flavour; skin of a dark tinge with mottled streaks; flesh red; somewhat similar in shape to the well-known Cuban Queen, being nearly round; it is somewhat better in flavour than the Cuban Queen; it bears abundantly and should be a good melon for marketing, or, as it is usually termed, "a good shipping variety"; seed very dark and speckled.

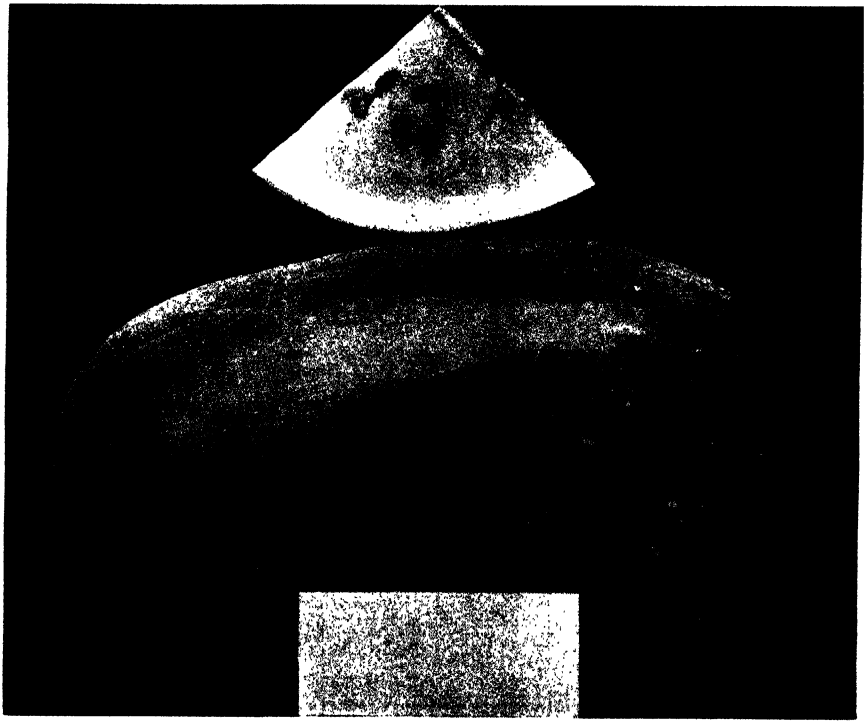
Cuban Queen.—A well-known melon, and somewhat a favourite with growers; the flesh is bright crimson; the skin marked with mottled stripes; crops abundantly and is a good keeper; seed black.

Kolb's Gem.—Here it proved a bigger melon than the American Champion; the skin lighter than Cuban Queen, but of a dark shade of green with lighter marbled markings; flesh a deep pink to red; firm and crisp; flavour excellent and very sweet; in shape nearly round; seed very dark, in fact almost black, not unlike seed of American Champion; a heavy cropper and good marketing melon.

Ice Cream.—Skin light green, slightly mottled in its early growth; flesh bright scarlet; shape nearly round; a melon of fine flavour but medium size; seed white.

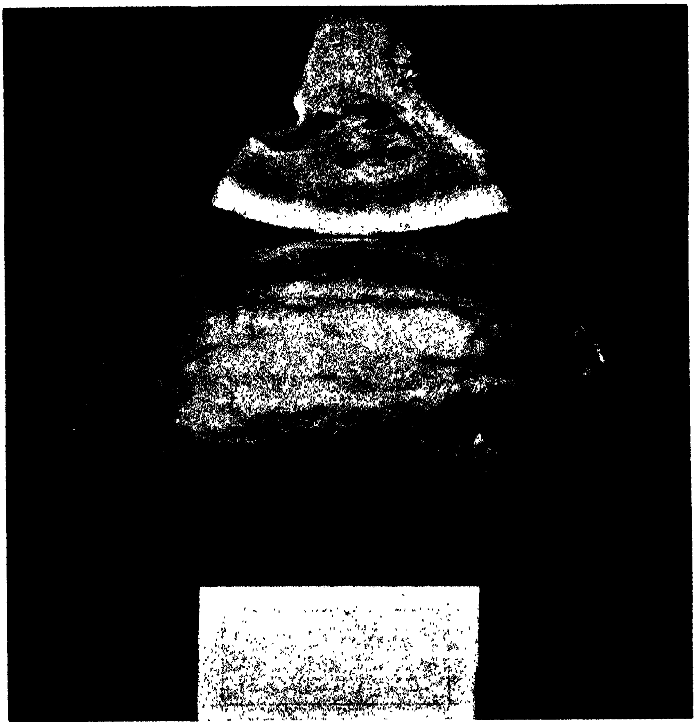


Ruby Gold.

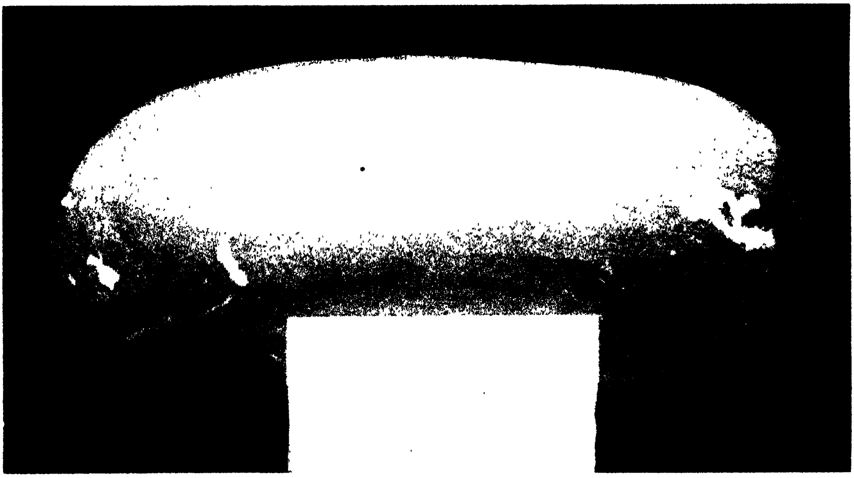


Black Spanish.

WATERMELONS.

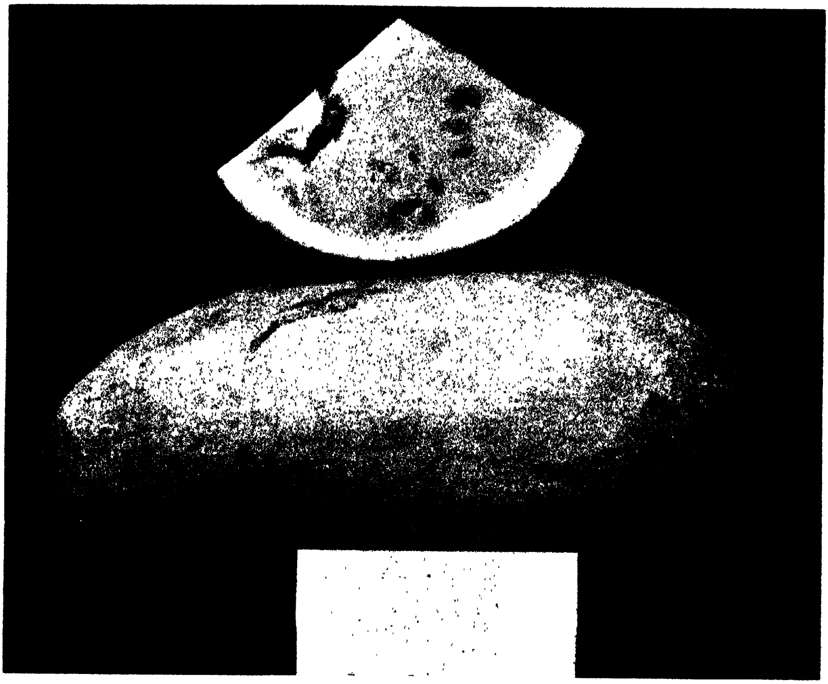


Black-seeded Japanese.

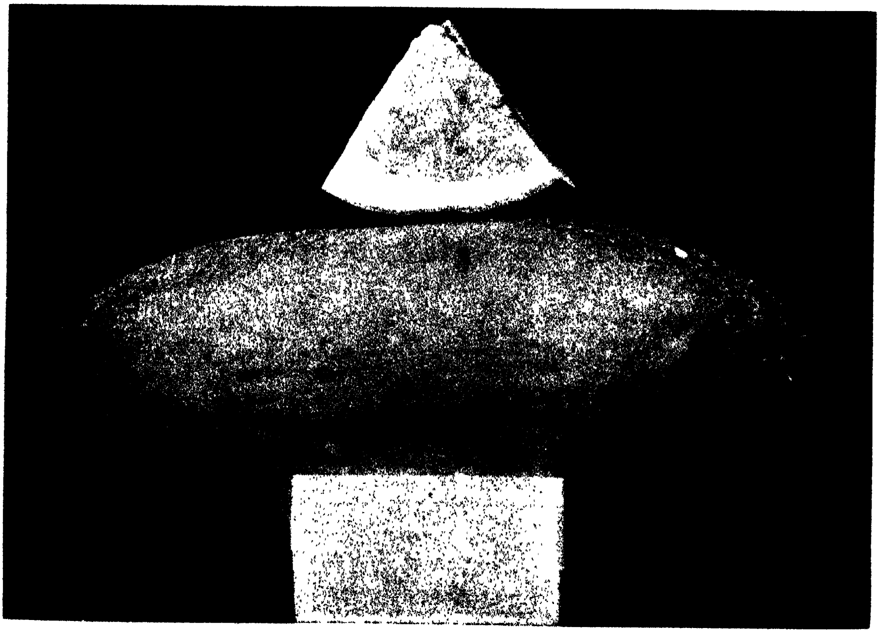


Sweet Siberian.

WATERMELONS.



Memphis.



Florida Favourite.

WATERMELONS.

Red-seeded Sugar Melon.—A fairly good melon; almost oblong in shape; flesh firm; rind thin; proved a poor keeper here; bruises readily and also spots if kept any time.

Ruby Gold.—Owing to over-ripeness a sectional cut could not be obtained. It is a melon of moderate dimensions, nearly round; the outer skin green with lighter spots or shades; flesh bright yellow and beautifully marked; a very pleasing novelty for the table; the flavour fair; seed light coloured.

Black Spanish.—A melon generally regarded as a good cropper, and of a nice flavour; flesh red and firm; seed black; skin a dark green; shape oblong. This variety, as grown at Wollongbar, at times has not come up to expectations in point of flavour; still very good flavoured melons are produced of this variety. It is a good keeper and a very heavy melon.

Black-seeded Japanese.—Skin very dark green; flesh a peculiar deep red when very ripe; very sweet; many of the fruits are hollow towards the centre; dark seed. It soon deteriorates internally when fully ripe. So far, it is not a variety to be recommended for table. A very heavy cropper.

Sweet Siberian.—Grown from specially imported American seed. Apparently an excellent variety for the table as a novelty of delicate flavour. It will not keep for long when fully ripe. Flesh a sort of rich cream yellow, sweet, and of a flavour peculiarly its own in richness; not a large melon, but an excellent fruit; would not be a good keeper for marketing; seed white.

Memphis.—Grown from specially imported American seed; shape oblong; skin light green with markings; flesh firm and a brilliant red, free from stringiness; rind thin; flavour very fine; it is large in size and moderately good keeper; seed dark brown.

Florida Favourite.—Grown from specially imported American seed; a beautiful melon; flesh dark pink or light crimson, firm and sweet; seeds white; rind thin; colour of skin green, slightly mottled; shape lengthy oblong; an early melon, weighty, and a good keeper.

McIvor.—Grown from specially imported American seed; a champion melon as regards flavour; shape oblong; skin green and mottled; flesh a deep pink, deliciously sugary and melting; somewhat resembles Mammoth Ironclad; seed white; splendid keeper; grows to a large size.

The Jones.—Grown from specially imported American seed; shape, nearly round; skin solid green, considerably ribbed; rind thin; flesh, deep crimson, and of excellent flavour; seed white. It appears to be too crisp and brittle to stand much knocking about for marketing.

Besides the above melons illustrated, there were several others grown at the farm, but illustrations could not be obtained of them. One of the very best was Cole's Early Water-melon, grown from seed supplied by Anderson & Co. It is not a large melon here, but is an abundant cropper and solid fruit; the flesh bright red, crisp, and delicate in flavour; an early melon.

Volga.—A light-coloured melon, perfectly round in shape; flesh bright red, of excellent flavour.

The Dixie.—Skin a dark green, striped; flesh bright red, and of excellent flavour; shape, oblong; a good all-round melon; crops well, and sound and hardy for marketing.

The New National.—Grown from seeds supplied by the Rumsey Seed Co., Barber's Creek, New South Wales; was an excellent melon, some of the fruits being fairly large; in shape the melon was disposed, in some cases, to be round, but there were some large-sized, oblong melons on the vines; flesh red, flavour very fine; the outer skin, and in general characteristics, it appeared to closely resemble the melon named Memphis, already described. The New National is an excellent melon, and a good cropper.

In conclusion, while on the subject of melons, mention may be made of those used in making preserves.

Three kinds have been grown on the farm. *The Silver Blue Jam Melon* or *Japanese Silver Jam Melon* is a very excellent preserving melon. The flesh is white and very firm. The melon grows to a great size, and has an outward appearance all its own, owing to the peculiar bluish colour of the outer skin, covered with a white bloom, giving it a frosted appearance.

The Red-seeded Citron Melon.—Outer skin green, with white mottled streaks; shape round, very solid; a great cropper.

The Citron Melon.—Skin green and mottled, oblong in shape, seeds of a dull dark colour. A very excellent melon, and, by some housewives, is used in preference to the round, red-seeded preserving-melon.

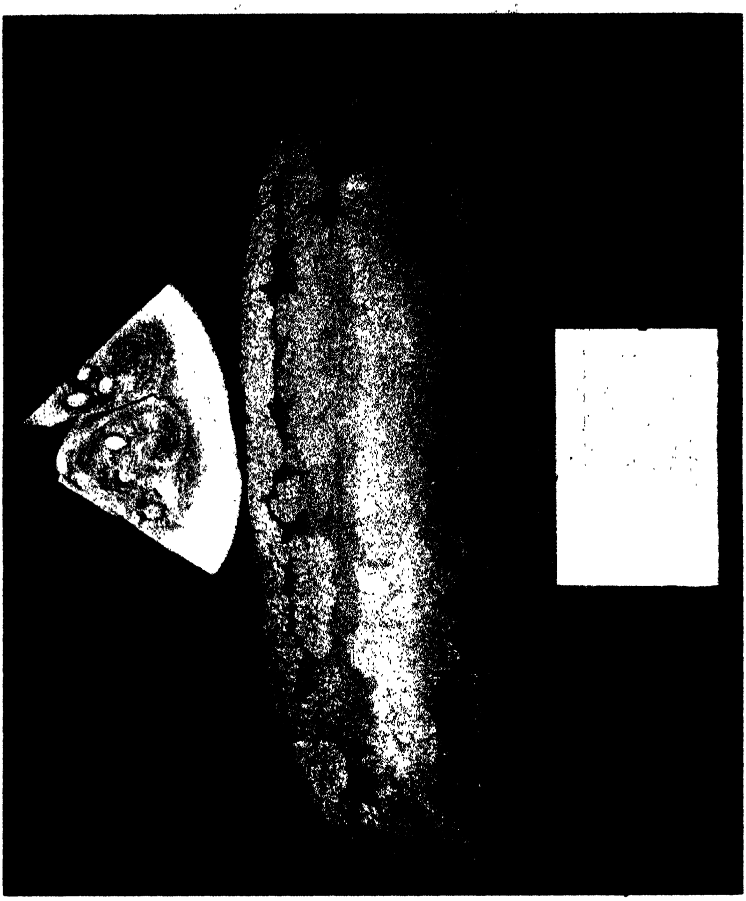
As to the best water-melons to grow, that would be a very hard matter to decide. Opinions differ so much in the matter of taste in flavour, &c., &c.

On the growth, &c., at Wollongbar, for all-round generally excellent melons, I prefer McIvor, Mammoth Ironclad, American Champion, Kolb's Gem, Cole's Early, and the Cuban Queen. For the private grower, who wishes to have a change occasionally in the way of table fruit, Ruby Gold, Sweet Siberian, Memphis, New National, Ice Cream.

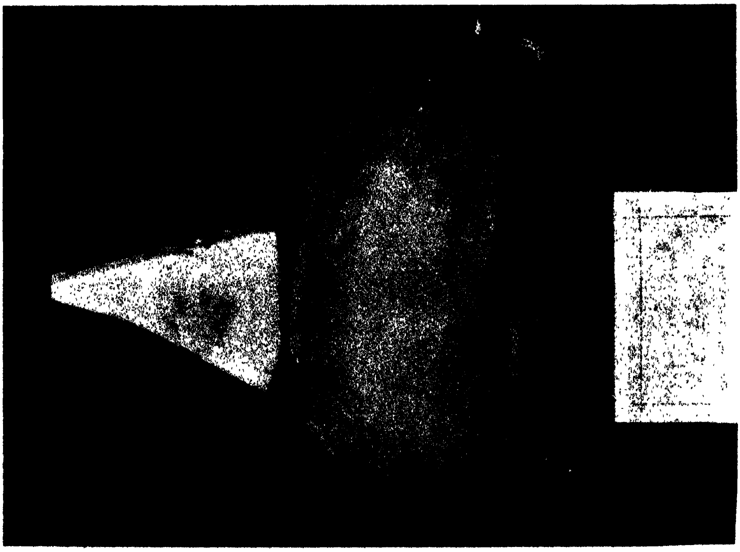
WORMS IN PIGS.

THE following simple remedies may safely be tried where worms prove troublesome:—Fluid extract of spigelia and senna in equal parts, given in half-ounce doses every four hours until it causes purging. Turpentine in milk, from one to twenty drops, three times a day. Tobacco boiled down to a strong decoction in water, given in teaspoonful doses, three days in succession. All these doses are for full-grown animals.—*The Cable.*

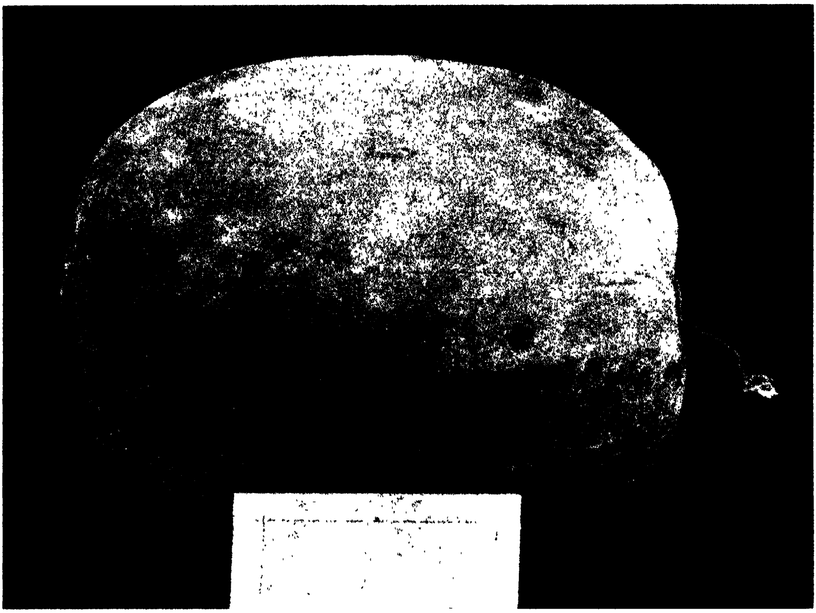
WATERMELONS.



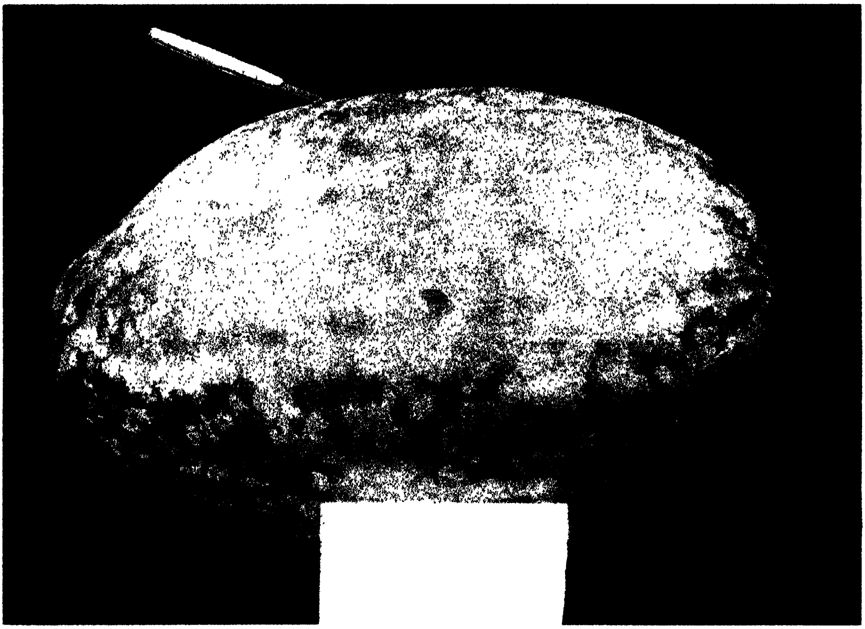
McIvor.



The Jones.

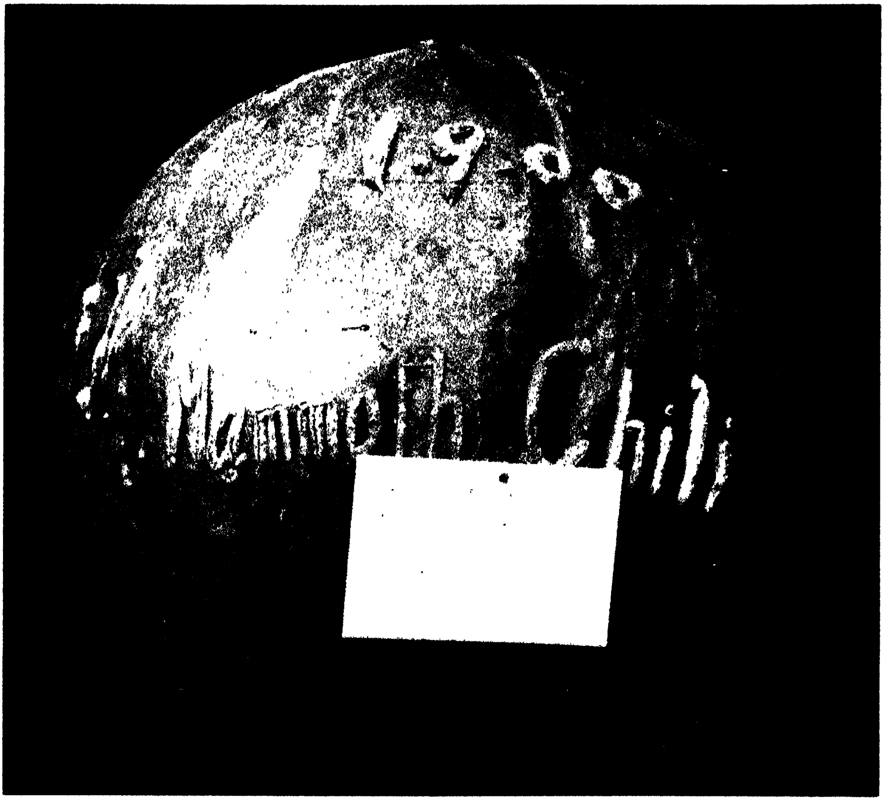


Japanese Silver Jam Melon.



Citron Melon.

PRESERVING MELONS.



The Mammoth Chili Squash.

A very large growing variety. The skin is of an orange colour; the flesh yellow; flavour good. Owing to its size and productiveness this is a valuable melon to grow for cattle and pigs.

Yellow Blight of Potatoes.

THE Congested Districts Board for Ireland have prepared information, for the use of their agricultural inspectors and instructors, concerning the stalk disease (*Peziza postuma*) and the root-rot fungus, which are associated with the appearance of the "yellow" blight of potato plants.

It is stated that, in many cases, more particularly in the west of Ireland, the potato leaves turn yellow long before the normal time when the plants die down; in some kinds, for instance, which should last till the end of September, the leaves turn yellow or are quite gone at the end of July. This early yellowing is a sign of disease, and plants with such leaves do not give their full yield of tubers.

On the underground parts of such plants fine branching threads may be seen, particularly with a magnifying glass. These threads are part of a fungus which attacks the plant underground, both inside and outside, and prevents the roots from doing their work—that of taking up from the soil the water and mineral matter needed by the plant. The fungus also attacks the roots of all kinds of weeds in the potato plot, and in this way creeps more easily from a diseased potato plant to a healthy one, and facilitates the spread of the disease.

The same potato plant with the yellow leaves and the root fungus is often found suffering from the "stalk" disease, in which the stem, either just above the ground or throughout a large part of it, is no longer green, but white, dry, and hollow. The decay of the stem causes it to topple over, and a badly infected plot will at times appear as if the plants had been trodden down.

When the roots die, little black swellings—sclerotia—are found on them, and similar swellings may also be found on the leaves, stalks, or tubers. The decaying leaves often also have little greyish-white tufts of easily detached spores, or "conidia," upon them. These sclerotia serve to preserve the fungus from one year to another, while the conidia also help to spread the disease.

The difficulty of stamping out the yellow blight is increased by the fact that the disease attacks the many different kind of weeds in the potato beds; hence all weeds growing with the crops should be pulled up and burned. The remedial measures recommended consist chiefly in cutting away and burning all affected parts, as well as the roots, stalks, and decaying leaves which remain after the crop has been removed, care been taken not to let the sclerotia fall to the ground. A heavy dressing of lime, especially in peaty land, is said to be an advantage, with deep trenching and good drainage and aeration. As a preventive measure the Congested District Board recommend the steeping of seed tubers, if any suspicion attaches to them, in a half per cent. solution of copper sulphate before they are pitted.—*Board of Agriculture, England.*

The City Agriculturist.

W. H. CLARKE.

In the two preceding articles something was said about clearing and fencing. We now come to the third stage, which is the most important of all—preparation of the land for sowing and planting.

Breaking-up with the Plough.

It is not much use specifying, under the peculiar circumstances surrounding the operations of a city agriculturist, any exact time or season for breaking-up land. That will depend upon when it can be cleared of timber and cleaned up; but it is well to remember that, if the work can possibly be undertaken towards the close of summer or beginning of autumn, and when the land has been fairly well moistened (not saturated), the best results may be expected.

Throughout the districts to which it must be understood these notes apply the beginner on virgin land is thrown into a quandary as soon as he thinks about breaking up his soil. Theoretically he may know that land like his—about 4 to 8 inches of indifferent soil, overlying a couple of feet or more of pretty stiff clay—should be ploughed to the depth of the top-soil and subsoiled a foot or more below that. Actually, he will find that, while it is comparatively easy to get somebody who has a plough and a couple of horses to break up the surface, it is next door to impossible to find anyone who can undertake the subsoiling; because, in the first place, a man of any knowledge of the requirements would not dream of trying to do the work properly with less than four horses, and he knows pretty well that, notwithstanding the nice appearance of the surface, he will not be able to go a chain without encountering a root big and tough enough to straighten the draw-links or burst up the plough.

Of course, if one can afford the expenditure, nothing is impossible—the stuck plough can be dug and cut out; the broken iron and harness can be repaired; or another £5 per acre can be spent on searching for and removing hidden stumps.

If the land has been well and honestly cleared, a single-furrow two-horse plough in good hands will break up the surface-soil well; and in favoured localities it may be possible to get down another 4 or 5 inches with a second plough, without a mould-board, running in the same furrow, and that is the most that the beginner of limited means, in the greater portion of the county of Cumberland, can hope to do with ploughs on a small area. On large areas the matter is entirely different; the stray stumps and roots that mar the passage of light implements are simply torn to smithereens by heavy ploughs and big steady teams. In some orchards attempts have been made to top-plough to a depth of 1 foot with six horses. The plan may be good, or it may, in course of time, prove to be very much the other way; but still it is not only out of the question for a little orchard, but is a practice beginners who desire to get the most out of their land at least expenditure are counselled not to follow. According to the experience of the writer, and careful inquiries extending over a considerable time, the cost of the first breaking-up of well-cleared land of the average type—that is, ploughing to the depth of the surface-soil with an ordinary long mould-board two-horse plough of the Parramatta type, is £2 for a single acre, and of course less per acre for larger areas. Where the timber has been at all heavy, the ploughman, who loses a day or so carting his plough to and from the place and rarely gets through without a breakage of some kind, earns, so far as the writer has been able to observe, every penny of that. As a rule the cleared areas, instead of being as long and narrow as possible to facilitate ploughing, are square or no shape, and the short turns take as much or more out of the team as the actual draught of the plough.

The admirable little short-breasted and other types of single horse-ploughs that are so useful in an established orchard or market garden are too light for breaking up new land of a clayey nature, and it is, moreover, not only sheer barbarity to a single horse, but the chances are that after he has laboriously struggled through half an acre his shoulders will be wrung to pieces, and he will be made too nervous to be safely used among young trees or among drilled crops.

When the land is being broken up for the first time it should be stipulated that the furrow should not be too wide. Nothing appears to be commoner than the practice of turning a 12 or 14 in. furrow with a plough that is not made to do good work with a cut above 10 inches wide. This leads to pig-rooting and "troughs," and there is neither sense nor good in it. In land strewn with chips, strips of bark, and sticks one cannot expect fancy work: all that is desired and should be insisted upon is that the furrows should be quite parallel and left as rough as possible. If the soil is too wet when the work is done you will, in clay soils, have a series of three-cornered strips that you can saw off into bricks a good deal more readily than you or the air, frost, and sun can reduce to a crumbly mass. If the ploughing has been carried out during February or March, and you wish to plant the same year, the land might be allowed to lie fallow for a month or perhaps two months. Then it can be broken down with a light harrow or scraper. The latter is an effective device which the writer can recommend, not only as a cheap and readily-made substitute for a harrow, but as an implement that can scarcely be excelled for crushing clods, levelling-off, and preparing small areas of land for seed and manure.

Harrows suitable for a single horse are obtainable at a most reasonable price, but after the first preparation of orchard and market-garden land, where a horse-hoe will be found indispensable, there is really not much use for a harrow.

The device in question is made, as shown in the diagram, fig. 14, of a couple of pieces of timber of about the stoutness of that used for fence-posts, 6 feet long, to which are nailed, or otherwise fastened, cross-pieces of triangular heartwood, or more substantial and expensive timber edged with angle-iron.

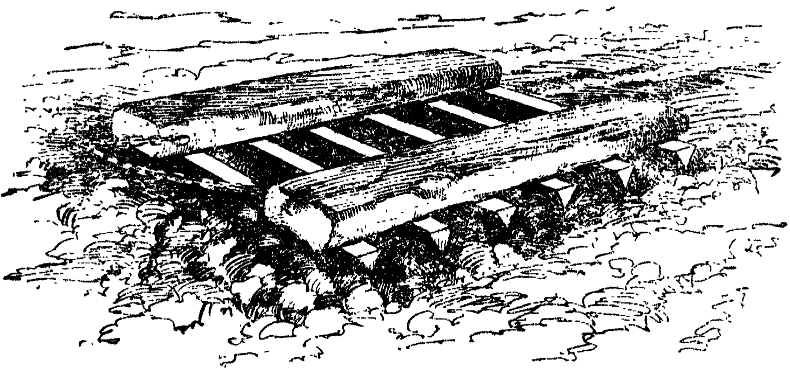


Fig. 14.

A couple of hooks or ringbolts are placed as shown, and to these the swingle-bar is made fast.

It is drawn over the roughly-ploughed ground in the direction of the furrows as soon as the soil has been rendered crumbly by a fair rainfall. A floor can be improvised with a sheet of bark, on which can be laid weights in the shape of stones or pieces of timber, or the driver can stand or sit on the drag. The effect is to thoroughly pulverise the clods, free the greater number of small roots, bracken, &c., and leave the surface nice and mellow, so that as soon as the rubbish—roots, ferns, &c.—has been raked into heaps and removed, the land can be evenly limed or sown with a catch crop of rape or oats. If possible, it is best to apply the lime at this stage, at the rate of 1 ton per acre (14 lb. to each 16½ feet square), and lightly harrow or fork it in. When the lime is kept perfectly dry in a shed of some kind, and applied evenly and in due proportion on levelled soil, the work is easier and the application far more beneficial than when the lime is scattered haphazard or has been allowed to become wet and set into lumps. The best time to apply the dressing is on a dewy, still evening, or when the soil is wet, so that the minute particles of lime will cling and not be blown away. If one attempts to apply lime on a windy day, half of it will be blown away before it reaches the soil, and if spread in the morning on dry soil the chances are that a breeze may spring up before it can be incorporated with the soil, and much of the material will be whirled off.

For three weeks to a month after the application of lime no seed should be sown. At the expiration of that time, and if there be a couple of months to spare before tree-planting time (June--July for deciduous trees, and August, November, or March for evergreens), it will be a good plan to put in a crop of some leguminous plants, rape, or oats. Without the addition of some fertiliser, such as bone-dust, superphosphate or stable manure, you will probably not get much of a crop; but what there is will be useful to turn under to help conserve moisture for the young trees during their first summer.

Some authorities consider that, if virgin soil has been thoroughly tilled and sweetened by application of lime and exposure for several months to the ameliorating influence of the weather, manure other than that supplied to the young tree in the form of a leaf-mould or stable-manure mulch in summer, and dug in in winter, is not necessary during the first two years. That is all very well where the soil is naturally rich in vegetable matter and manurial elements. But most of the soils of the County of Cumberland are not over-rich; and if well-rotted, or even fresh, stable manure, sheep manure, or a few pounds of some slow-acting manure like bone-dust and blood, can be applied and thoroughly worked into the soil *at least a couple of months before planting-time*, the young tree will thrive from the start. Such manures should, however, not be applied in excessive quantities. It is quite possible in new land, especially when it is not naturally or artificially well drained, to set up by the too lavish use of crude fertilisers a condition which is very bad for young trees. The whole system of the young tree suffers a shock in transplanting, and the enfeebled rootlets are no more able to absorb and digest coarse, ill-prepared food than a yearling infant can thrive on steak and onions.

If you can get a moderate amount of manure (about 28 lb. stable-compost or 4 lb. bonedust per 8 square feet) well incorporated with the soil not less than two months in advance, do it by all means; but if that is not possible, put the manure aside until the tree is planted, and then apply it to the surface about the tree so that the rain may wash the good down for the use of the young tree in the shape of digestible broth.

A couple of weeks before planting-time the area should be again ploughed and cross-ploughed as deeply as a single-horse plough can run without lifting raw clay. If time cannot be spared to do this, the strips in which trees will stand should be ploughed about twelve furrows wide. At any rate, no effort should be spared to get the tree-places thoroughly aerated and pulverised. After the work of planting is completed, the intervening strips can be treated with plough and harrow or scraper until the whole area is in good tilth and ready for the easy passage of the horse-hoe, or even hand wheel-hoe, with which summer cultivation will be carried out.

It will thus be seen that the cost of breaking up a small area with the plough, and preparing it for planting trees or vegetables, will cost roughly:—

	£	s.	d.	
*First ploughing	2	0	0	per acre.
*Harrowing	0	10	0	,,
Harrowing in lime	0	10	0	,,
Ploughing with his own single horse-plough (say)	1	0	0	,,
Say	4	0	0	,,

Which, all going satisfactorily, represents a well-prepared layer of soil at most 8 inches deep. In time to come, when the rotting and removal of roots will have rendered subsoiling of the spaces between the trees possible, he will probably spend another £3 per acre on subsoiling, bringing the outlay to about £7.

Trenching and Other Means of Breaking Up.

In large orchards and farms established on clayey soils trenching is pretty well out of the question on the score of expense. But it is also undesirable, as compared with subsoiling, on account of the time that must be allowed after rain before heavy teams can be taken on the land; still a good many of the older class of orchardists contend that for citrus orchards horse-work is no cheaper and not half so satisfactory as hand-work, and in support of their opinion they can point to thriving and most productive orchards that were set out in hoe-broken or deeply trenched land thirty or forty years ago. But the times have changed, and conditions have become different. Land is dearer, labour of the kind required for successful hand-tillage is more expensive, the natural supplies of fertilisers that could be had for the mere foraging have diminished, exotic pests have to be grappled with. All these things force the beginner of limited means, no matter how much aware he may be of the advantages of getting the soil into absolutely tip-top condition before planting, to look around for a method of preparing the land in a way that will permit of the trees getting the desired start, and at the same time not be so prolonged or expensive as regular trenching.

Say, a person who can afford to have prepared only 1 acre per year decides to have the area trenched. He will find that there are various ways of doing this, all of which have their advocates. The two principal methods may be said to be (*a*) breaking the surface soil and breaking the subsoil without mixing them or changing their respective positions; (*b*) breaking the surface and subsoil, and thoroughly mixing them.

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* It is presumed that as a two-horse plough and a harrow will be of little use to the holder of a little place after the land is first broken up, he will hire rather than purchase such implements; though, it can be seen, they soon earn their cost.

The latter, in conjunction with liberal liming and the application of plenty of slow-acting manure, is unquestionably the better system, but it is slow and almost prohibitive on the score of expense. The former costs many pounds per acre less, and can be done for from about £12 per acre, according to the way the work is laid out.

It will be necessary to remove and put aside the layer of top soil from the first strip. Then the bared subsoil will be either broken with a pick, a hoe, or a digging fork, according to the depth decided upon. The writer has recently trenched a fairly-sized patch for a little vineyard in the following, which, it may be agreed, is about the simplest way:—Starting at the highest corner, a line was run along the outer edge of the piece of land to be trenched, and a peg was put in at each end. Then, with a piece of stick 3 feet long, a strip a yard wide was measured off from the two pegs and a line marked out with a cord stretched between the two new pegs.

The top soil of No. 1 strip was broken and shovelled into a cart to be carried to the far end of the area. Then the subsoil was thoroughly broken to the full depth of an ordinary four-pronged digging fork. That completed, the next strip (a yard wide) was marked off and the top soil from that strip was thrown on to the broken subsoil of the first strip. The surface soil of No. 3 was thrown on to the broken subsoil of No. 2, and so on to the last strip, upon which was spread the top soil of No. 1, thus completing the work. The advantages of this system are that the top soil is thoroughly pulverised in the breaking up and shovelling, and in using a fork in the subsoil the operator stands on unbroken ground all the time, and does not trample the broken clay into a hard mass as he would inevitably do in using a pick or hoe.

Lime and wood ashes, at the rate of about 30 cwt. per acre, were spread over the area, and when that was forked in the surface was left even and mellow. About two months afterwards, twenty-five different varieties of vines were set out, and are thriving. The work was carried out at odd times, so it is impossible to say to an hour how long it took, but from rough calculations it would be probable that an experienced man could treat an acre in this way in five weeks. In doing this little job it may be mentioned that at least one-fifth of the time was occupied in removing roots and remains of stumps, of the presence of which there was not the faintest sign 10 inches from the surface, and any one of which might have smashed a subsoil plough. Luckily such conditions are not likely to be met with everywhere, but they must be expected in land that has borne heavy timber.

Plough Trenching.

The work could, of course, be greatly facilitated by first of all breaking-up the surface soil with a plough, and in some cases it might be possible, as well as economical, to use an ordinary two-horse plough in the subsoil. In doing this the area would be laid out in strips (up and down hill if on a slope), say, 5 feet wide. As in hand-trenching, the broken top soil of No. 1 strip would be removed for use on the last strip. Then the plough would be run through the bare subsoil of No. 1, running 4 or 5 inches with a mouldboard or deeper if a second plough with the mouldboard removed were available, or, if time could be spared to put it on and take it off for each class of soil. The top soil of No. 2 strip would be thrown on to the broken subsoil of No. 1, and so to the last strip. With sufficient assistance to man two lands, the ploughing of the surface soil and removal of it could be effected with expedition enough to keep the plough-team moving steadily all the time, working uphill through the surface and downhill through the subsoil.

Grubbing and Trenching Combined.

Another plan that might be tried where the area is limited to an acre or two is as follows :—Grub all the standing trees, and dispose of them in the most useful way. Then set to work and hand-trench the area strip by strip, taking out the stumps and roots as you come to them. In this way much time and labour will be saved, and when your trenching is completed the land will be in the best possible condition for the healthy growth of trees and crops.

Drainage.

In places where the subsoil is of a crumbly nature the question of drainage is not of extreme importance during the first few years, and can be left alone until the more pressing work of good tilth is well in hand. But where the surface soil is shallow and sticky, and the subsoil is as tough as putty, no matter whether the site is on a good slope or is in a hollow, drainage is a matter that will claim attention from the first. Instances may be quoted of flourishing plantations in stiff clay that have done well without drainage for years and years; but it will usually be found on investigation that such orchards cannot "stay" when the trees are called upon to bear and ripen fruit, and the soil is never "lively" enough to grow good vegetables. In badly drained land, lime, and manures containing lime, will correct sourness; but the effects are not lasting, and it will be found at the end of five years that about three times as much has been expended in this way with indifferent results than would have defrayed the cost of a system of drainage sufficiently effective to secure good results for twenty or thirty years, perhaps more.

In some of the lighter soils tile drains, laid about 3 feet deep between every second row of trees, will generally be ample to keep the soil warm and sweet.

In stiff soils the drains will need to be closer together, and perhaps not quite so deep.

There is only one way to drain land—that is, the right way; and it would be a waste of space for any one to attempt in an article of this kind to say what system, depth, and width could be relied upon to give good results under any general set of conditions. If beginners, contemplating drainage, will carefully read the chapter on the subject given in the *Farmers and Fruitgrowers' Guide*, and consult the Department as to any special features that arise in their case, there is little fear but that they will get advice and information that will enable them to set about the work with confidence and success.

Bee Calendar.

ALBERT GALE.

AUGUST.

NORTHWARDS, where indications of frost are seldom seen, spring flowers are already putting in an appearance. Even as far south as Sydney the deciduous trees are looking greener, leaf-buds developing, and blossom-buds bursting. Indeed, in the beginning of last month some fruit-trees in sheltered corners had put on their spring garb, but the cold winds blowing from the snow-clad mountains speedily checked their further advance. Still, between the wet days, when the sun shone bright and warm, the bees were bringing in pollen. From letters received, bee-keepers are expecting a good honey flow in the coming season. A wet winter and a drippy spring are always followed by a good honey harvest.

Therefore, on fine days overhaul your hives and note their condition as it regards food supply. If it be short, feed as previously advised. Developing brood must have plenty of honey and pollen food. If Nature is not supplying the latter in sufficient quantities to please you, pea-meal is as good a substitute as can be procured. Remove the bottom board and free them from all impurities of foreign matter—that is, supposing you use loose ones; they are by far the best. Remove empty combs, especially mouldy ones, leaving only sufficient for the present brood purposes, and afterwards add empty combs as the season may require. Your colonies will be sure to have dwindled somewhat since you put them up in the autumn; therefore, do not let them scatter over the combs too much; use division boards.

It is possible there will be seen dead bees in front of the hives. Most of these have died from old age.

If you have a doubt in your mind as to the cause of the death of your bees, send along some of the dead, describing the symptoms exhibited before death.

Farm Notes.

NORTHERN RIVERS DISTRICT—August.

H. V. JACKSON.

There will be plenty of work on the farm at this period, preparing land for crops, and seed sowing.

Onion beds will require to be kept free from weeds, and young onions may be transplanted if desired. For warm localities French beans may be sown; also sow cabbage, cauliflower, endive, Kohl rabi, lettuce, parsley, garden swede, turnip, red-beet and carrot. Plant out Jerusalem artichoke, rhubarb, cabbage, lettuce, &c. Arrowroot, yams, and tapioca may be planted. Plant potatoes, and sweet potato bulbs if any are available. Prepare land for planting bananas and pine apples.

The "Choko" should be planted alongside a trellis or framework; it bears abundantly in this climate, and is an excellent culinary vegetable.

Oats, barley, and rye may be sown for green fodder.

Sow mangolds in deeply worked soil, in drills 3 ft. 6 in. or 4 ft. apart, they are excellent for stock feeding.

Prepare land thoroughly for the sowing of broom millet seed. Plough and cross plough the land, and then harrow well, bringing the soil into fine condition, and free from trash of any previous crops and weeds. Sow in drills 3 ft. 6 in. or 4 ft. apart, the seed being 3 in. to 4 in. apart.

The crop must be kept clean between the rows, and if the growth is very vigorous and strong, it may be advisable to thin out some of the plants, especially if the sowing has been thick.

When the rows of plants are tall enough they should be lightly hilled, great care being taken not to run too near the plants and thereby injure the roots.

When the plants have flowered, and the seeds are forming, the heads should be bent downwards; the weight of the seed as it matures accentuates the droop, and long straight material is obtained. The heads should be cut, before the millet is what you would call perfectly ripe. When cut the heads should be dried in the field if possible, and then removed to a shed ready for "hackling"—that is, removing the seeds. In this climate, where rain is so frequent, it is advisable to have a shed where the millet can be spread and dried—being turned out every day.

"Hackling"—*i.e.*, stripping the seeds—is usually done by means of a machine called a "hackler." I have seen home-made hacklers used; but the machines are not expensive.

It is as well to grade the heads—*i.e.*, put the best heads together, separate from those of shorter lengths or inferior quality or colour. After being hackled and graded they may be packed in bales for despatch to market.

Lucerne may be sown if weather continues favourable. Plough deep and subsoil the land. Grass seeds may be sown.

Finish pruning in the orchard as soon as possible. Keep the orchard clean and spray the trees.

Finish pruning the grape-vines; cuttings of good varieties may be set out.

Some cattle in low condition, and that have not been looked after in any way, occasionally are subject to *Phthiriasis* or lousiness. These vermin cause a great deal of irritation, and should be got rid of quickly. There is the small biting ox louse (*Trichodectes scalaris*) and the large sucking ox louse (*Hæmatopinus eurysternus*).

A common remedy is a decoction of tobacco, with a little salt in it, applied to the skin, and repeated in a few days; or, if that fails, a dressing of whale oil, sulphur, and a little oil of tar. Another recipe is a lotion made in the following proportions:—Common tobacco, 1 ounce; white hellebore-root, ground, 2 ounces; vinegar, 2½ pints; boiled together for half an hour, and the warm mixture applied with a brush or a sponge; or lotion of creosote, 3 fluid ounces; methylated spirit, 2 fluid ounces; water sufficient to make half a pint in all. If greater quantities of lotion are required increase the ingredients accordingly. Pigs are also subject to this sort of vermin. If found, the animal should be well washed with soft soap, and exceedingly well dried; dry brushing with a stiff brush is also very beneficial. Sometimes the addition of kerosene to the water when washing the pig is a considerable aid to rid the animal of vermin. The pig-sty should be thoroughly cleaned out and whitewashed.

Horses will occasionally be found suffering from worms, although the animals are in fair condition, and with good feed and water; but the complaint in most cases is due to a debilitated system arising from old age, sickness or poverty, or pasturing on low-lying badly drained grass land, or where drinking-water is bad. Two kinds of worm are found in the horse—a long round worm, *Ascaris megalocephala* (sometimes 12 inches long) inhabiting the small intestines, and commonly discovered in the dung, and a small lively white worm (*Oxyuris curvula*) which is found in large numbers in the large intestines and rectum. A common remedy is turpentine and linseed oil, but the addition of a little tincture of opium tends to prevent griping. It is advisable to keep the horse without food for twelve hours before administering the medicine. The quantities for one dose are—

2 ounces turpentine.
1 pint linseed oil.
½ ounce tincture of opium.

This should be followed by a moderate purgative—say, linseed oil, 1 pint; or Barbados aloes, 2 to 7 drachms.

The animal should be stabled to avoid a chill, and the food should be of a laxative character, *i.e.*, bran and a little grain. If the purgative does not act, exercise the horse; but so soon as the medicine begins to act, return the animal to its stable.

Another mode of treatment is to administer a drachm of tartarised antimony every morning—followed on the seventh day by a dose of purgative.

Salt should be given in the food, and a change of feed is very beneficial.

Iron tonics following treatment are recommended :—

Tonic Powders—

½ ounce saccharated carbonate of iron.
½ ,, gentian powder.
1 ,, locust bean.

Mixed and given in the food night and morning; or

2 drachms sulphate of iron.
1 drachm ground ginger.
1 ,, gentian powder.
½ ounce locust bean.

RIVERINA DISTRICT—AUGUST.

Lucerne.

THE season is an exceptionally favourable one for sowing largely, and the opportunity should be availed of as far as possible.

Deep soil should be selected where it is available. The land should be subsoiled where possible, and if a proper subsoil plough should not be procurable an excellent substitute may be made by removing the mouldboard from an ordinary plough and following in the furrow made by a mouldboard plough drawn by another team.

Potatoes.

Planting should be carried out during this month.

The land should be deeply worked and brought into as fine a condition as possible. Medium-sized potatoes may be planted whole, the larger tubers being cut into sets, each piece having two or three eyes. Drills should be struck out 3 feet apart and the sets placed about 15 inches apart in the drills.

Australian Monarch, Adirondack, and Bliss' Triumph have given good results in dry seasons.

Green Fodder.

Barley may still be sown in moist situations for green fodder only.

Prepare land for sowing sorghum, millet, cow-pea, &c.

This is the best month for transplanting roots of *Paspalum dilatatum*, and the present favourable season should be availed of to establish it in these parts.

Vegetable Garden.

Sow onions for pickling and other purposes as early as possible in the month.

Sow peas, a few only.

Sow Tomatoes. Early Boronia, Honor Bright, Duke of York, and Fordhook—First gave good results in the past dry season. Transplant cabbage—St. John's Day, Early Drumhead, and Succession.

HAWKESBURY DISTRICT.—August.

By GEORGE VALDER.

This should be a very busy month for the farmer; every opportunity must be taken to get the land ready for spring crops, and early sowings should take place.

Maize.

During the past month we have had a very heavy rainfall, and there is every prospect of the season being a favourable one for early sowing, and, from all appearances, if the land can be got ready in time, a very large area will be put in. For its perfect growth, maize requires a rich, deep, friable soil. In all cases this land should be well drained, as the young plant suffers very quickly from excess of moisture. The ploughing should generally be deep, although for early sowing this is not as important as for late sowing. The time of planting depends much upon local conditions of soil and climate. On light, warm, sandy soils sowing should commence this month, but for the heavy loams early in September is better. Experiments made here prove that in most seasons, particularly the dry ones, the early-sown crops give the best results. Another matter that should receive more attention is the time of sowing the different varieties. As a rule, the slow-maturing sorts should be planted first and the quick-maturing be left till last, but occasionally it is advantageous to have a crop which is ready for harvesting early, and therefore a small area of some quick-maturing variety should be planted early. Last year, with us Early Mastodon appeared to stand the dry weather better than any other variety, but although called "early" it should be classed among the late-maturing varieties, as it certainly is not early in this district. Yellow and Red Hogan, Golden King, and Hawkesbury Champion are greatly in demand. At the last district show the latter two were strongly in evidence, but in the competition for the greatest percentage of grain to the cob, the long-grained varieties beat them badly. As I have stated before we are badly off for early-maturing varieties, but the Department, with the view of procuring some new and valuable sorts, obtained last year a quantity of seed from the United States for trial at the college farm and for distribution to farmers, and from these we hope to get several suitable varieties. Ploughing should be proceeded with as rapidly as possible, as even if the land is not required for some time, the exposure to the sun and air will greatly benefit it. For the late crops subsoiling has proved very successful.

Sorghum and Millets.

Small sowings should be made at the end of the month or early in September, in order to furnish green fodder during the summer. Hungarian millet is a very quick grower, and if the crop is cut before the heads begin to turn yellow it is excellent feed. It gives good results if sown broadcast, but is better if drilled in rows from 1 foot to 18 inches apart. Early Amber cane last season again proved superior to all other sorghums both in quality and yield, Planters' Friend coming next. Sown in drills of 3 feet apart with a corn planter, using 6 lb. seed per acre, and well cultivated with a horse hoe, sorghum will give a heavy crop of fodder even in a fairly dry season. Broom corn or broom millet should also be sown either at the end of this month or early in the next. Sow and cultivate in the same manner as sorghum.

Pumpkins and Melons.

Water melons, preserving melons, rock melons, pumpkins, squashes, and cucumbers should all be sown at the end of this month if the weather is favourable, but, as they are all very susceptible to frost, the time of planting will much depend upon the weather. The melon and pumpkin family do best on sandy well-drained soils having a clay subsoil. Although they require a large amount of moisture, a wet soil is their worst enemy. Soils rich in vegetable matter produce size at the expense of quality. The land should be deeply and thoroughly worked, as no crop answers more readily to thorough cultivation. They follow well after leguminous crops, and on most soils a complete manure should be applied, a mixture of superphosphate, kainit, and sulphate of ammonia being about the best.

Mangolds and Sugar Beet

should be largely sown for fodder. They are valuable for feeding to all kinds of stock, and being easily stored they come in well in times of drought. The land, for mangolds, should be ploughed and subsoiled to a depth of 12 to 15 inches, and then be brought to a fine tilth. In the moist districts it is a good plan to throw up ridges and sow the seed on these. The drills should be 20 to 30 inches apart, and the plants must be thinned out to from 15 to 20 inches apart. For the deep, rich loams Mammoth Long Red is the best variety, and for the shallower soils the Globe or Tankard varieties. For sugar beet the land should be prepared in the same way as for mangolds, but the drills should be closer, say from 15 to 18 inches apart, and the beets thinned out to 10 to 12 inches apart. For mangolds the best results are obtained by heavy dressings of farm-yard manure, or with superphosphate and kainit. For sugar beet use superphosphate and blood manure.

Potatoes

should be largely planted this month. The potato requires a soil that is in a high state of fertility, the direct application of fertilizers to the crop is attended with considerable uncertainty, and therefore the soil should be brought to the proper condition by enriching the land for previous crops. Leguminous crops, manured and well cultivated in drills, form an excellent preparation for potatoes. The system of cultivation depends much on the climate, soil, and conditions under which the crop is grown. The land should be deeply and thoroughly worked, drills are then struck out about 3 feet apart. The early varieties can be sown about 15 to 18 inches apart in the drill, and the late 18 to 20 inches. The best quality potatoes should be used for seed, either whole tubers, or pieces of about 2 oz. in weight, give the best result. When the tubers are cut, it is a good plan to dust them over with wood ashes.

Sweet Potatoes.

The tubers should be placed in the propagating beds as soon as possible. Choose a warm corner of the garden and make small beds, using light, loamy soil, mixed with well-rotted farm-yard manure, or leaf mould. Lay the tubers on this bed close together, and cover lightly with soil, water freely, and cover from frosts. As the weather becomes warm, the tubers will send out a large number of shoots, from which the cuttings for planting out will be obtained.

Jerusalem Artichokes, Arrowroot, and Chicory.

can be planted at the end of this month.

Tobacco and Tomatoes,

if not already sown, should be put in as soon as possible.

Pea and Bean Family.

Early sowings of summer pulses should be made, but many of the species are very tender, and unless the warm weather comes in early, most of them, such as cow peas, lima beans, &c., should be left until next month.

Lucerne.

As a rule, I would advise sowing lucerne in autumn, but in the coastal districts spring sowings often do very well. The seed should be sown as soon as frosts are over, and with a favourable spring the young plants will make a very rapid growth. The land should be as free as possible from weed seeds, and it will pay to give it a deep and thorough working.

Orchard Notes.

W. J. ALLEN.

AUGUST.

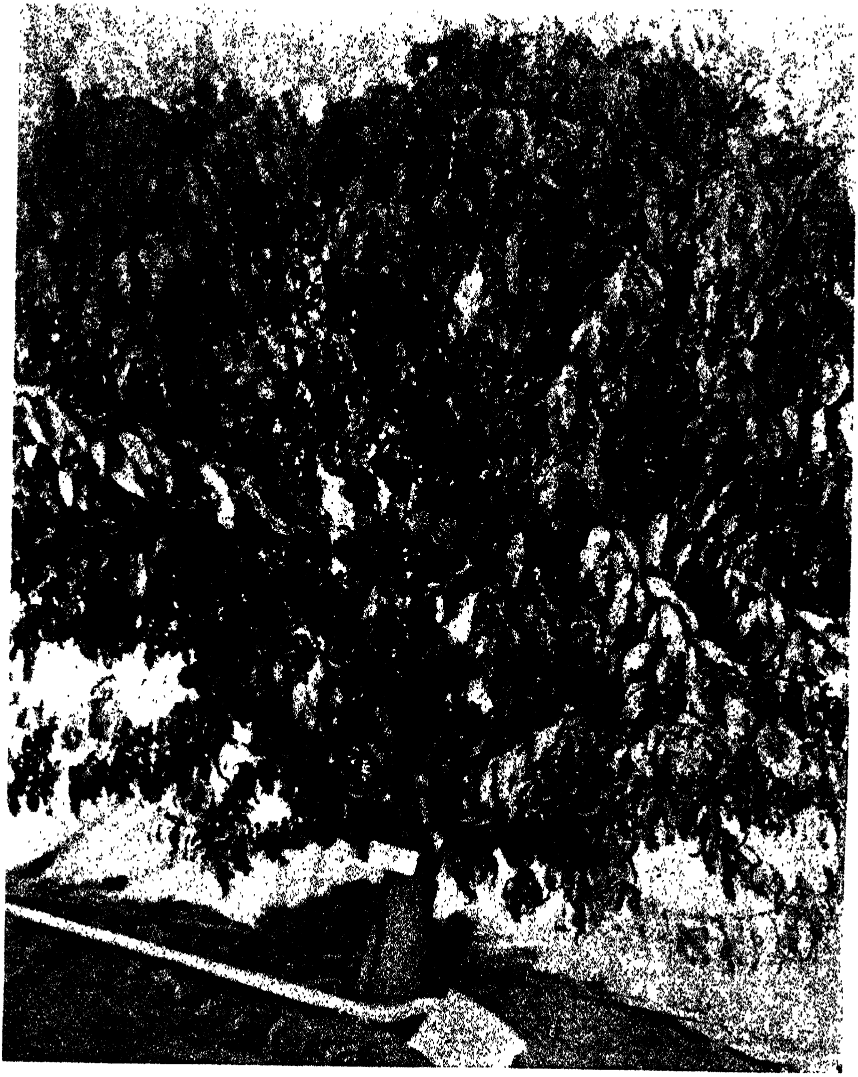
DURING the past two months the whole Colony (with the exception of a few of the westerly districts) has been visited by splendid rains which have saturated the land to a considerable depth. In heavy undrained land the rain will not be altogether an unmixed blessing, but in naturally-drained soil and properly-drained lands the prospects for the coming season are the best we have had for many years. It is an almost invariable rule that, when orchards and vineyards receive a thorough soaking during the winter, we can expect a full crop of fruit of good average quality, provided they have received proper attention during the spring and summer months.

One result of these heavy downfalls was that ploughing and cultivation of orchards was found impracticable; the orchardist, however, need not worry himself over this, because if there is any one time of the year when such land requires a rest from work it is during the months of April, May, June, and July—during which time the weeds may be allowed to grow if they will, but they must be turned under, if the season is not too wet, by the latter part of August. Many orchardists have planted crimson clover, peas, and vetches to turn under as a green manure, and these and the weeds when turned under add a considerable quantity of humus to the soil, and if ploughed in about the end of this month should have time to become well rotted before the dry weather sets in, and also before they have had time to ripen their seeds.

I have repeatedly pointed out, and I think every grower will admit after the experiences of the past few years, that our only safe plan is to give cultivation our very best attention if we hope to harvest a good crop of fruit and keep our trees in a healthy growing condition. It has been well demonstrated during the last three or four dry seasons that we must depend upon ourselves rather than the weather, and those who have kept their land thoroughly cultivated have, in spite of the bad seasons, taken off good paying crops of fruit.

The pruning of deciduous trees and vines should be finished as early as possible in the month, so that the trees may receive a spraying with the salt, sulphur, and lime solution, and the vines be swabbed with sulphuric acid and sulphate of iron.

Many orchardists may say, "Oh, my orchard is clean, and it is only a waste of time giving it this yearly winter spraying," but in these



LOVELL PEACH.

days we cannot afford to run any risks nor to allow any disease the opportunity of establishing itself in our orchards unknown to us by neglecting to use preventives, as when once an orchard becomes diseased it takes a lot of hard fighting to eradicate the trouble, particularly when there are neighbouring orchards, some of which being neglected serve as centres of infection for the whole surrounding district. For the man who does try to keep his place reasonably clean it would be a good thing if those who neglect their places were compelled either to do their best to clean them, or else to destroy them, because a neglected orchard is of no earthly value to its owner and is a serious menace to the whole district.

The black aphis of the peach-tree will be hard at work and breeding very fast just now, and the woolly aphis on the apples will require attention. A spraying with resin and soda will be found beneficial for both. Tobacco and soap is also a good spray for the black aphis.

Where trees of any kind have been attacked by shot-hole fungus, powdery mildew, scab, curl-leaf, or other fungus diseases, spray at least a fortnight to a month before the buds begin to open with Bordeaux mixture.

Citrus-trees may be planted at the end of this month in districts where rain is depended on and where irrigation is not practicable.

All old bark should be scraped from off apple and pear trees and such scrapings burnt, and everything in the orchard which would be a harbour for codlin moth destroyed. It behoves every orchardist to exert himself to keep down this most serious pest, which, to my mind, is much harder to fight than even the dreaded San Jose scale, and I fear that unless united action is taken we will never be successful in eradicating it.

Keep all fruit-houses as clean as possible, as there is no doubt that they are responsible for harbouring a good many moths every year; therefore keep the rooms as air-tight as possible, and as soon as the moths begin to hatch in the spring burn sulphur fumes in the rooms once every other day for a fortnight, so that the moths may be destroyed as they begin to fly.

In working around the vines keep a sharp lookout for the pupæ of the vine moth. If there are any partially old, partially rotted stakes the pupæ will be found adhering to these and also under the old bark which is hanging to the vine. Crush these wherever found, and thus assist in keeping this pest under as far as possible.

The grafting of deciduous trees may be pushed forward this month, and all stock carrying dormant buds should be cut back to within 5 inches of the bud and planted out in rows 4 feet apart, the trees 1 foot apart in the row. This gives plenty of room to work between the rows with a horse and single cultivator.

Where fumigation of citrus-trees is practised the last week of this month is a good time to commence operations, so as to have this work completed before there is any danger of destroying the scale-eating ladybirds or their larvæ. Where spraying is to be practised this is a good time to make the first application.

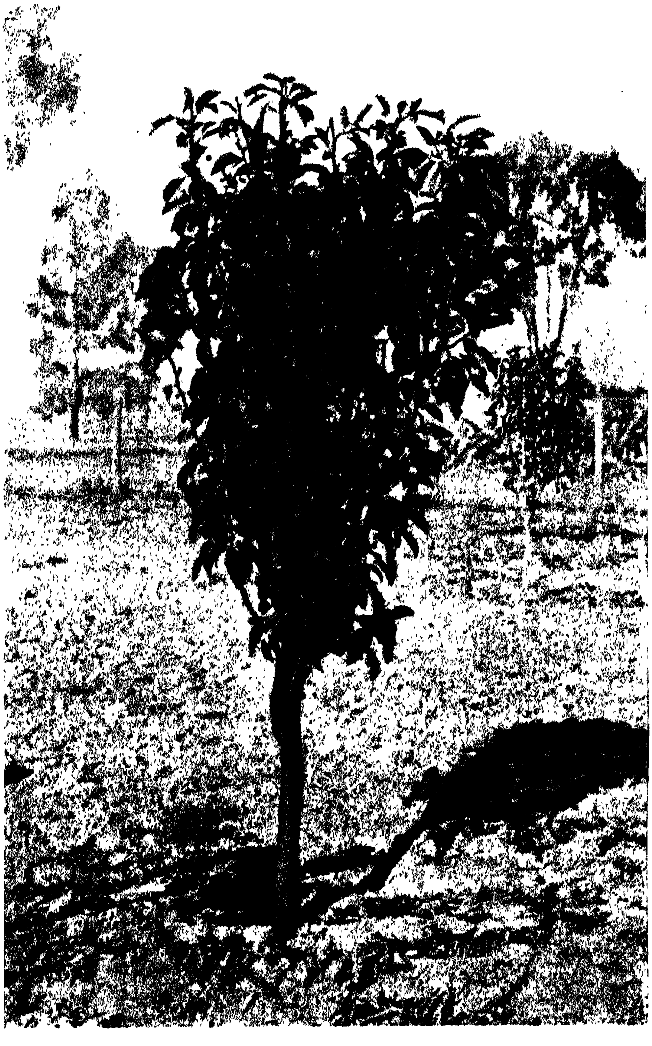
The resin mixture and blue oil emulsion are the two sprays which gave best results in a series of experiments carried out in June of last year. In my last month's notes I spoke of pure kerosene as being a good spray for San Jose scale, and I would advise those who have any on their apple or other trees to use this. In case orchardists may have any misgivings as to the effects of pure kerosene on the tree itself, I can only refer to the results of some thousands of experiments conducted by Professor J. Smith, State Entomologist, of New Jersey, and described some months ago in the *Agricultural Gazette*, and to what I have done personally and seen done in this Colony. For instance, at Bathurst Farm last winter, I found a young pear-tree badly infested with San Jose scale. I had it pruned, and then carefully painted all over the bark with undiluted kerosene (not blue oil) applied with a brush. Care was taken that the oil did not run down to the roots. The result of the treatment is shown in the accompanying photograph of the tree taken in the following December.

A book on the insect and fungus diseases of fruits and their remedies may be obtained from the Government Printer for the sum of one shilling. Every fruit-grower should have one of these for reference.

I am repeatedly being asked as to what number of trees or vines set at different distances apart are required to plant an acre; the following table may therefore be of interest:—

Planted	30	feet x	30	feet	requires	50	trees or vines.
,,	25	,,	25	,,	,,	70	,,
,,	20	,,	24	,,	,,	90	,,
,,	20	,,	20	,,	,,	110	,,
,,	20	,,	18	,,	,,	121	,,
,,	18	,,	18	,,	,,	135	,,
,,	15	,,	18	,,	,,	161	,,
,,	15	,,	15	,,	,,	195	,,
,,	12	,,	15	,,	,,	242	,,
,,	12	,,	12	,,	,,	300	,,
,,	10	,,	12	,,	,,	363	,,
,,	10	,,	10	,,	,,	435	,,
,,	10	,,	8	,,	,,	544	,,
,,	8	,,	8	,,	,,	680	,,
,,	6	,,	6	,,	,,	1,210	,,
,,	5	,,	5	,,	,,	1,740	,,
,,	4	,,	4	,,	,,	2,725	,,

Lovell Peach.—The accompanying illustration is that of the "Lovell" peach-tree which is growing in our Wagga orchard, and has produced some of the best fruit so far grown in that orchard. This tree can, therefore, be recommended for growing in that and similar districts. The peach is a freestone of large and uniform size, almost round, flesh firm and yellow to the pit. The tree is a good grower and bearer, and the fruit is superior for either canning, shipping, or drying.



A PEAR-TREE AT BATHURST ORCHARD,

which was badly infested with San José Scale last winter, and treated with undiluted kerosene.

The photograph was taken in December.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF AUGUST.

Vegetables.

IN many parts of the Colony this month may be considered the beginning of spring, a busy time for the gardener who can start sowing and planting many kinds of vegetables, including those known as tender, or which cannot bear frosts. In the colder and elevated portions of the Colony it is too soon to think of planting or sowing tender vegetables.

The tomato is tender, but as it has become so extremely popular, and is in such great demand, great efforts are generally made to raise a crop of fruit as early as possible, and all sorts of contrivances are used to protect young tomatoes which have been planted out in the garden. Boxes, bags, kerosene tins, and indeed anything that is likely to keep away frost, may be laid over the plants at nights.

In Great Britain enormous glass houses are devoted for a time to the production of early tomatoes which are raised in them by the ton, and this industry seems to have become exceedingly remunerative to the growers.

There are places in this Colony where early tomatoes can be raised without the aid of glass, and where enterprising growers might do well should there be facilities for marketing them.

August is a good time for the sowing of onions extensively; and as this vegetable succeeds well in various parts of the Colony, no one with a garden should be without a supply. It seems surprising that all the onions required for consumption in New South Wales are not produced in the Colony; but this is not the case by a very long way. There are localities where large yields of onions may be obtained, but strange to say there is but little enterprise in the way of onion-growing.

Asparagus.—If directions have been followed, the ground for this vegetable should be quite ready for the planting, which may be done during the month when the plants are showing signs of starting into growth. When raising asparagus plants from the nursery-bed avoid as much as possible breaking the roots. By a little careful management with a fork this may be successfully performed to the advantage of the plants. Make the trenches broad enough to permit you to spread out the roots to their full extent, keeping the crowns slightly raised, and let the crowns be so deep only that when they are covered up they shall be as near as possible 2 inches below the surface. When filling up the trenches use fine soil immediately about the roots. An extensive asparagus-bed is not necessary to meet the requirements of a family; therefore, the planting of one, even with the greatest care, need not occupy a very great deal of time, and once it is planted it will last for very many years after cutting begins.

Artichoke, Jerusalem.—This tuberous-rooted sunflower is one of the best vegetables that could be grown, for it is nutritious and palatable, and generally appreciated by most people. Plant out extensively during the early part of the month in the warm districts of the Colony. In the cool parts, planting might be delayed a little later if the tubers can be obtained. The white-skinned variety will be found the best. Plant it in trenches made about 6 inches deep and 3 feet, or even more than that, apart. Drop the tubers into the trenches about 1 foot apart. The plants will grow until they are cut down by cold weather next autumn, when the tubers will be fit for use.

Beans, French or Kidney.—Wherever frosts are over seed of this good vegetable may be sown in drills 3 inches deep about 2 feet 6 inches or 3 feet apart. Drop in the seeds about 4 inches apart.

Beet, Red.—Should you have any ground just vacated by cabbage use this for red beet or for any other root crop, such as carrots, for the remains of the manure applied for the cabbage will suffice for the roots, and they will not be so liable to fork or become ungainly in appearance as they would if fresh manure were applied. Sow in drills about 18 inches apart and about 1 inch deep; when the plants come up and are about 3 or 4 inches high thin them out gradually until the plants to be grown are about 9 inches or 1 foot apart. Try the globe varieties, which can be highly recommended.

Silver Beet.—Sow in a seed-bed and afterwards transplant when the seedlings are large enough to shift without risk; use manure heavily for this plant.

Cabbage, Cauliflower, Broccoli, Brussels Sprouts, Savoy should all be sown. Plants from previous sowings should be pricked out, and any from previous prickings out that are in a proper condition should be planted in the places prepared for them. A little forethought and management will enable anyone to keep a small succession of those vegetables always available, from the seedlings to the matured plants. They all need most liberal supplies of rich farm-yard manure, and are very much improved by frequent cultivation.

Celery.—Sow a little seed, and if any plants are ready plant out in shallow trenches into which abundance of manure has been dug. Well-grown plants should be earthed up for blanching preparatory to cutting for table.

Cardoon.—Sow a little seed, and if you have any plants large enough plant them out about 3 feet apart each way. When these are fully grown the inside leaves need blanching to make them sufficiently tender for use. This may be done by tying all the leaves together and then by covering all with straw or bagging of some kind.

Celeriac or *Turnip-rooted Celery.*—This is a most useful variety, and well worth a trial. Sow a little seed and plant out well-grown seedlings into well-manured ground about 1 foot apart.

Carrot.—Sow largely in rows about 1 foot apart.

Cucumber and Melons.—Seed may be sown in all localities where frosts are not likely to occur. Plants which have been raised under shelter may be put out in well-manured ground.

Onion.—Sow largely or plant from specially-made beds. Use abundance of manure, for the onion likes to be well fed. Make the surface of the onion-bed as fine and level as you can, and sow the seed very shallow in drills 12 or 15 inches apart. Keep the seedlings quite free from weeds and thin out gradually.

Lettuce.—Sow seed in a seed-bed, and should you have any plants large enough plant them out, taking great care not to break their roots.

Parsnip.—Sow largely in drills.

Peas.—May be sown extensively on well-manured ground in rows about 3 feet apart. Sow the seed about 3 inches deep and about 4 inches apart. Stick all young peas as soon as they appear above the soil.

Radish.—Sow a few rows of several kinds. Manure well with well-rotted dung.

Rhubarb.—As the plants will soon be starting into growth, they may be planted, presuming that the land has already been prepared for them as previously advised. Plant about 3 to 4 feet apart each way, and let the crown of the plants be about 2 or 3 inches below the surface of the ground where they are covered.

Salsify, or Vegetable Oyster.—Sow in rows about 15 inches apart in light rich soil, and when the plants come up thin out to 5 or 6 inches apart.

Turnip.—Sow in drills about 1 foot or 15 inches apart.

Tomato.—When all danger from frosts has passed, plant out from the seed-bed any young tomatoes that may be ready. Seed may be sown largely in specially-prepared seed-beds for planting out later on. It is very risky to plant tomatoes where frosts are likely to occur. If the soil is in fairly good heart there is little or no need to apply manure for tomatoes, which are not infrequently over-manured.

Flowers.

MANY of the spring flowering bulbs are very conspicuous during this month, notably the daffodils, fresias, anemones, and ranunculuses, although the last two may be a little later in many places.

This is a good time to sow all sorts of tender annuals, but in the cool districts they will need protection until danger from frosts has passed. Some of the best annuals to grow are aster, balsam, *Bartonia aurea*, *Browallia alata*, Coreopsis, candytuft, cornflower, Marguerite, cockscomb, Clarkia, cosmos, single, double, and cactus dahlias, which may be treated as annuals, although the tubers will last for years, sunflowers, sweet peas, linum coccineum, lobelia, lupin, mignonette, forget-me-not, nasturtium, nemophila, petunia, phlox Drummondii, portulaca, rhodanthe, salpiglossis, scabiosa, stocks, marigold, Virginian stocks, and zinnea.

In point of fact, all sorts of flower seeds, both annual, biennial, and perennial, may be sown towards the end of the month.

All sorts of evergreens for the garden or for shelter purposes may be planted out now. The best time for planting them is in the early autumn, but if that time was missed on account of dry weather, or other reasons, the present opportunity should be taken, but protect the plants with a good heavy mulch of manure, and if hot weather is likely to occur, shade with light brush, and if necessary apply water occasionally, but in plenty.

All those roses which need it may be pruned during the month. The hybrid perpetuals are almost certain to need pretty severe cutting back; the strong-growing kinds more than those which do not make much growth.

Teas and hybrid teas need less pruning than other kinds, unless they have become a mass of short, straggly growth, when it would be as well to cut this all, or nearly all, away, and give the plants a chance to make new healthy wood.

The main point to remember is that rose-blooms are produced on new wood, except in the case of some of the climbing varieties, like the Banksias, which it is not desirable to prune except in the summer or soon after the flowering season is over, when they can make new wood to ripen before the next spring.

A great deal can be done in the spring to regulate the growth of roses by disbudding– that is, the removal of all wood-buds, as they start into growth, which are likely to become too numerous, and thereby weaken one another, and also to interfere with the form of the plant.

The rose is one of the best of garden plants to grow; it will endure drought as well, if not better, than most plants, and it will give satisfaction for a vast number of years if kindly treated; indeed, the rose will thrive for years and years under most adverse circumstances, and new life and vigour can be put into very old specimens by cleaning them up and providing them with good food.

General Notes.

THE EFFECTS OF GREEN SORGHUM.

FROM time to time reports come to hand that dairy cattle have died as the result of feeding upon sorghum. In some instances large numbers of valuable animals have been victims, and, despite assurances to the contrary, it is evident that quite a number of dairy farmers are under the impression that there is some poisonous principle in the plant that is responsible for the death of cattle.

The opinions expressed by the experts of this department, and published in the *Agricultural Gazette*, are that the trouble is entirely due to cattle eating to excess of immature sorghum, and this view of the case is confirmed by a series of investigations conducted at the Nebraska Experiment Station, United States, where similar losses have occurred.

The symptoms noted in America are: "The animals bloat very little. They apparently suffer terribly, and die very suddenly. Post-mortem examinations are reported to show lesions in the stomach, the membrane turning black." [This is somewhat vague.]

The investigation was made in the following way:—"A sample of cane that had produced fatal results was obtained and subjected to a careful chemical analysis. All efforts, however, to isolate and identify poisonous matter failed utterly. Although an effort was made to detect the presence of toxic substances in small quantities, it was assumed that refined delicate tests for traces of such poison were really unnecessary, from the nature of the case. A poison that will kill a full-grown animal in ten or fifteen minutes must necessarily be present in relatively large proportions. The analysis showed only a trace of potassium nitrate. Cultures made to develop toxic bacteria from the sample gave negative results. The leaves and stems of the material seemed to be free from parasitic growth. No poisonous matter that might have been applied purposely to the leaves was detected."

The *Pacific Rural Press* of California, where the same trouble has been experienced, in commenting upon these results, says:

"All the data collected indicates plainly that first growth sorghum may prove, at times, to be just as fatal as second growth. This controverts the prevailing popular impression, but facts at hand nevertheless corroborate such a view. It is in harmony with what is known of the chemistry of all plants. The chemical substances found in plant tissues are characteristic of the plant and are found in it in its various stages of growth.

"The results of the investigation indicate then, first, that in sorghum there is no inherent chemical poison; and, second, that second growth cane, of itself, is no more injurious than first growth. The fact that so many fatalities occur proves that there is an element of danger in using sorghum for pasturage, and that considerable care should be taken in feeding it. Stockmen generally are agreed that hungry cattle should not be turned on to sorghum pasture, even for a short time."

The season for planting the various kinds of sorghum is now almost at hand, and, in view of the value of this crop for fodder, it would be a pity if anyone should be deterred from putting in a good area. No fear of evil results need be apprehended, if, as already pointed out in these pages, due precaution be taken not to feed the sorghum until the plants are mature. Then the comparative toughness of the stalks makes it impossible for cattle to "bolt" them, as they do the more succulent young plants, and, moreover, the crop as a fodder is infinitely richer and more palatable if left on its roots until the sugar has set. To prevent the cattle getting at the growing crop, the fences, especially those of long standing, need to be carefully watched for weak places, and it is well to separate from the respectable members of the herd any old "rogue" cows that have learned the trick of dropping rails and unfastening gates.

GROWING SWEET POTATOES.

A VIRGINIAN farmer, in the *American Agriculturist*, gives the following advice on growing sweet potatoes:—To begin with, soil free from stone seems essential, and a clay loam the best. The field is well ploughed and the soil turned up in high ridges, far enough apart to be worked by a one-horse cultivator. I leave the field for a couple of days or so, for the soil to become warm and well dried out.

Perhaps you buy the plants. I make a square of boards, a foot and a half to two feet deep, in a sunny place, and fill with mast (dried pine needles, tea-tree leaves or forest oak needles would serve the same purpose), slightly mixed with dry clay loam, for a depth sufficient for the seed potatoes to be placed on end. I place them close together and over all put a covering of mast. If mast is unobtainable, a lot of finely cut straw will do, being careful that it is not put on too thickly. The sun is allowed to shine in a while, then towards night a muslin cover is put on. This is wholly or partly removed at times, but must remain on over night. The potatoes are given an occasional light sprinkling, unless nature uses her watering pot on them. It will not be long before crisp, tender, green leaves will peep through the mast, which must lie thin and light. When sprouts are from 5 to 8 inches long, one can readily pull them, one at a time, by hand through the mast, pulling only such as are of proper length for planting from day to day.

When ready to plant, a quantity of the sprouts are supposed to be large enough two or three days after the ridging. One person begins at the end of the row, and with a gardener's trowel quickly makes little openings 18 inches apart on top of the ridge. He does this in an even manner, and another follows with bucket or apron full of the slips and drops one, stem end down, in each little hole. Next the one who used the trowel comes along with a bucket of tempered water, and a small dipper, and puts a small quantity of water in each hole with the plant, while the man who dropped the slips follows closely behind, and with one quick movement of both hands firms down the soil around each slip. It has been quick work, and the rows look even and handsome. The dipper of water keeps the slip fresh until it starts its rootlets. One may look over a large patch and scarcely see a lost plant. During the season, the cultivator goes through twice. Weeds are not very prolific then, and the plants get ahead rapidly.

PICKLES.

NEARLY everybody eats pickles of some kind, but the quantity used in this Colony is really astonishing. From England, Scotland, and America thousands of cases of preserved vegetables and condiments reach Sydney every month. This seems a great pity, especially when at agricultural shows one sees the splendid preserves some of the women competitors have displayed.

In Great Britain the number of persons engaged in the production of vegetables and the manufacture of pickles is, as everyone knows, very large; but in the eastern portion of the United States the industry has taken root and is spreading to the tune of millions.

As an instance of their enterprise in this direction, the following account by Mr. W. E. Stone, of Rhode Island, of one of the big pickle companies, is worth reading:—

"The Budlong Company, near Providence, Rhode Island, has been in existence since 1850. Their yearly cultivation covers 500 acres, employing in 1899 in all branches about seventy hands. The leading feature of the business is pickling. The works are located about 4½ miles from the city, and a large produce trade is carried on. During spring and autumn harvesting daily trains of ten to thirteen carloads are run to Boston, the largest market of the company. The buildings cover several acres, and the pickling plant has turned out regularly four to five cars a day of pickled products, comprising cucumbers, onions, horseradish, and similar products. The hotbeds have a glass area of 6 acres. Employees of the factory department number about 250.

"Cucumber pickling is the largest special branch. About 200 acres are generally devoted to the culture of cucumbers, and the outdoor crop last year amounted to 100,000 bu. To see a company of seventy-five to one hundred women and boys engaged in picking the small cucumbers is an interesting sight. They are paid for the work at the rate of 12c. per bu., and a good picker can make $2 to $3 per day. The fields are picked over every day. The firm also operates a cucumber farm of 100 acres on Long Island, where the cucumbers are salted and cured. In the winter months they are brought to Providence by schooner loads."

"THE process of onion-pickling deserves notice. The bulbs are allowed to attain the size of an inch or a little more in diameter before pulling. During the time of growth the plants are under continual cultivation.

The entire care of the onion crop after the sowing by machines is given to women labourers. The plants are given individual care in hoeing, and the work is repeated at frequent intervals. After they have attained the desired size, the tops are cut off with large knives in the hands of the women labourers. At this period the field presents a lively appearance. Teams and men are busy gathering up the barrels to cart them away. The women are natives of Italy, and their jaunty costumes and agile movements give the field an exceedingly businesslike air. Sometimes as many as 600 work in a company, and one day's gathering has amounted to 3,000 bus. After the tops are cut off, the roots are raked out with potato-diggers. The onions are then gathered into baskets and barrelled to be carried to the salting-tanks. The market onions are dried for several weeks on the field in racks. The pickling onions are salted immediately after reaching the factory. After they are taken from the brine, the root and top of each are carefully trimmed off by the women, and each is carefully peeled. With the addition of the prepared vinegar the process is complete."

HOW TO MAKE THE GARDEN PAY.

THE first work to be done to make the garden pay, says C. L. Allen, in the *American Agriculturist*, is to put the soil in condition for planting. No matter what the character of the soil, it should never be stirred when so wet that the particles will not separate freely when the spade or the plough and the harrow are used. It must always be made as fine as it is possible to make it. If the plot is small, the spading fork, if properly used, will leave the soil in fit condition for planting; excepting for very fine seeds, when it will be necessary to use a fine rake, as not a particle of earth should be as large as the seed that is to be put in it. The manure used should have been provided several months ago, so that it can be pulverized as finely as the soil. Then it should be so thoroughly and evenly incorporated that the one could scarcely be distinguished from the other. When commercial fertilisers are used, as they always should be, in equal proportions, when the soil is continually worked, let them be evenly distributed.

No matter what the size of the plot may be, not more than one-fourth —one-sixth would be better—should be used in the first planting. For profit, as well as for pleasure, plantings should be made at frequent intervals, because there are but few vegetables that are in the best condition for use longer than a few days. As soon as the first planting is made, preparations for the second should commence, and so on to the end of the season. The moment the first planting has been gathered, clear the ground as quickly as possible and prepare for a second planting, and follow up this plan the entire season. The preparation of the soil, so far as the application of manure is concerned, and making it fine, must be as thorough for each subsequent crop as for the first. Do not think that once working and once feeding is sufficient for the season; it is not. No more manure should be used at one time than a given crop will require. A surplus is nearly as fatal to the production of a crop as a deficit. Plants to be productive must needs have just as much nourishment as they can assimilate, but not be stimulated to excess, which is fatal to productiveness. For success, every foot of the soil should be constantly at work producing something. Nature will not tolerate idleness; if the gardener does not plant, she will. There is no reason why, in ordinary seasons, the garden cannot be as green and productive in summer as in spring. To that end, intensive cultivation is a necessity. The surface must at all times be covered with a growing crop, and so thickly as to, in a great measure, prevent evaporation. But by no means plant so thickly that each plant cannot have all the room for growth and air required. Room for a horse to walk between the rows is the poorest economy possible, besides it is not necessary. For instance, when we set our cabbage or cauliflower plants, which require the greater part of the season to mature, make an intermediate row of some quick-growing vegetable.

Imitate our up-to-date market gardeners near all large cities. When they set their early cabbage plants they are in rows 30 inches apart, the plants 15 inches apart in the row. Between these plants they put a plant of lettuce, and between each row of cabbage a row of lettuce; then between the rows of cabbage and lettuce they sow a row of radishes, which gives but about 7 inches to a row of vegetables. The radishes will be marketed before the lettuce will require their space, and in turn the lettuce will be marketed by the time the cabbage begins to head. By this method every particle of the soil finds some work to do, and as the ground is nearly shaded at all times by the growing crops, evaporation is slow, consequently it is ever moist and in a condition to encourage active growth.

NIGHTSOIL FOR MANURIAL PURPOSES.

MR. C. F. FIELD of Chassarfield, Condoblin, writes: "As human excreta is known to be the best of all manures, it is a crying shame that so many thousands of tons of it should be wasted annually, for by its use the fertility of our fields, orchards, &c., could be wonderfully increased. I think the objection most people have to it is the disgusting smell attending the handling of it; and I think that if the smell could be done away with, most sensible people would be willing to use it; and if mixed with other substances in the compost heap and thoroughly rotted, I can conceive of no sensible objection to its use. I have given the matter consideration for some time, and have adopted the following plan by which I can make use of the excreta and handle it without disgust. It is an unsavoury subject to write or think about, and your readers may think I am a man with a hobby and without sense of smell; but, so far from that being the case, I can assure them that I have an extremely sensitive nose and can always detect a bad odor or strange smell sooner than most people. However, I must return to the aforesaid plan. This requires a building specially erected for the purpose, the size of which can be made to suit requirements. My building is the ordinary wooden closet, 6 feet by 4 feet 6 inches, without pit, but differing from the ordinary earth closet system, as all liquid runs away. The seat is raised about 12 inches higher than the usual size, with foot board in front, and the sides, back, and bottom underneath seat are lined with galvanized iron and sloped at the bottom to carry off all liquid, which runs underneath door at the back into the compost heap behind. The bin for compost heap is constructed in a similar way to that advocated by Mr. W. Hessell Hall in the letter I sent you from him, and published in the "*Gazette*" for January, 1900. The bin is about 9 feet square and 4 feet high, and I made a pit 12 inches deep, which I filled with leaves and wheat chaff (beeswings) to absorb urine, slops, &c. At the back of closet I hung a door on hinges to lift up and kept in position by a light log laid along the bottom, the log being secured by two pegs, one at each end, driven into the ground. When the whole was ready for use I placed about 6 inches of "beeswings" at the bottom, and a month or so later the back door was raised and propped up by the log, and one sweep of the stable fork deposited the mass on the compost heap, where it was soon covered over. By this method there is hardly any smell, but by using earth or ashes in the closet I think it could be managed with absolutely no smell. I think a better way of dealing with it than the ordinary compost heap would be to have a compost heap for the excreta alone, and it could be given a longer time to rot. I think this plan might with advantage be adopted by not only the people who have gardens, orchards, &c., but even by people in the towns and suburbs, and where they have no use for the manure themselves they could sell it. If it was done systematically, and always kept well covered, I see no reason why the system should not come into general use, and it would do away with that midnight rest disturber—the night-cart."

FUMIGATING NURSERY STOCK.

FOLLOWING the suggestions published in the June number of the *Agricultural Gazette*, by the Fruit Expert, to the effect that nurserymen should make arrangements to fumigate or otherwise treat nursery stock to guard against the dissemination of disease and pests, the department is in receipt of a communication from one of the leading nurserymen of the County of Cumberland stating that he has erected a fumigator, and intends submitting everything sent out to the influence of cyanide of potassium fumes.

This is a step in the right direction, and the general adoption of the system will prove of lasting benefit to all purchasers of young trees. The majority of nurserymen take every precaution to avoid insect and fungus diseases, but some of the worst pests enjoy stages in their life-history when they are so small as to evade the most diligent search. The consequence is that frequently the most careful nurseryman may be accused of helping to spread a pest, when in reality nothing but subjection of the trees to searching and deadly fumes could prevent the trouble.

WHITLINGHAM RED POLLED RECORD FOR 1899.

THE Whitlingham herd of Red Polled cows (Mr. Garrett Taylor's) in 1899 gave the following results. Where there is a blank in the return, the cow was either introduced into the herd by purchase, or the milk was not recorded in 1898.

Number, name, and tribe of cow.	Calf.	Record in lb. 1899.	Daily average.	Record in 1898.
9461 Kathleen—A 24	3rd	12,235¾	33·61	——
7845 Eyke Jessie—I 2	4th	10,624	32·39	10,325½
7732 Casket 2nd—A 4	6th	10,383¾	30·01	8,460¾
6270 Countess 2nd—Q 1	6th	9,822¼	28·63	9,924
6667 Primula 3rd—A 1	——	9,613	28·32	——
8789 Nest—N 6	4th	9,516¾	26·58	——
6501 Lovely 7th—I 12	7th	9,303¼	25·55	6,522¾
5729 Milly—N 4	8th	8,977¼	27·87	8,491½
6819 Top—T 4	7th	8,890½	28·22	6,762
5409 Dolly—R 11	8th	8,729¾	25·08	5,814
6199 Blossom 5th—A 5	5th	8,459½	26·19	10,247
8565 Little Lass—A 22	3rd	8,430¼	24·19	9,657½
4807 Carlista 2nd—A 4	8th	8,410	25·71	10,086
6330 Elmham Rosebud 4th—A 1 ..	7th	8,222	22·91	10,038¼
5431 Dummy 2nd—O 9	7th	8,049	31·31	4,209¼
5367 Coronet 2nd—T 1	6th	7,870¼	25·97	5,952
8391 Buttercup—P 3	6th	7,727½	26·52	7,244½
5852 Pop 2nd	8th	7,603	24·63	5,443¼
8124 Prioress 2nd—V 11	6th	7,598¾	24·91	7,466¼
8239 Sunshine—T 7	5th	7,544¼	24·49	7,164¼
9223 Connie—O 2	3rd	7,525½	22·87	6,008
6814 Tiff 2nd—T 4	5th	7,445¼	25·97	7,623¼
4981 Fawn—R 11	9th	7,377½	24·51	8,663¼
10273 Floss—A 24	2nd	7,334	25·55	——
6246 Chrissy—W 3	——	7,288½	24·21	7,769
5652 Linnet 2nd—E 2	7th	7,238¼	24·04	7,926½
8927 Rose—P 7	3rd	7,163½	21·77	——
8749 Miss Flighty—K 15	4th	7,055¾	25·19	9,933¾
8832 Peggy 2nd V 11	2nd	6,712	24·71	——
9853 Sunshine—R 1	3rd	6,524½	27·41	6,825¾
9230 Countess 3rd—Q 1	1st	6,450	22·47	——
6267 Cosy—A 4	2nd	6,312¼	22·53	5,790½
6385 Georgina 2nd—E 11	8th	6,259¼	20·33	7,244
9887 Victoria—T 6	7th	6,065	20·14	5,277
6895 Atkins 2nd—K 17	3rd	6,053¾	23·81	5,584½
5576 Jewess—I 21	——	6,046½	21·06	4,580¼
6162 Arrow—E 11	7th	6,023½	21·82	8,233
2018 Betsy—W 3	7th	6,023½	17·92	7,458
10116 Cosy 3rd—A 4	——	5,721½	18·16	——
10582 Nougat—O 5	1st	5,671¾	21·32	——
10813 Sunflower—T 7	3rd	5,616	20·96	——
8417 Coral—E 3	1st	5,536¼	15·30	——
10803 Suffolk—W 2	——	5,507¼	20·39	——
5016 Mindful—W 3.	2nd	5,503½	24·21	2,492
11028 Caister Ceres—V 9	7th	5,493¼	18·25	——
8581 Harvest Moon—V 9	3rd	5,492	23·73	4,572½
6498 Lovely 4th—I 12	5th	5,453½	16·14	7,375
10258 Fillpail 2nd—R 11	{ 2nd 3rd }	5,426¾	18·77	5,973
7295 Malmaison—O 1	6th	5,416	27·63	5,067¼
6185 14th Belle of Suffolk—W 2	6th	5,350	14·64	6,383½
6469 Kittiwake—L 12	——	5,349½	29·39	——
4949 Hetty 2nd—S 3	9th	5,343¾	17·07	4,474
10014 Biddy—E 11	2nd	5,213½	18·55	4,962½
10817 Sweetmeat—E 13	3rd	5,209¼	15·83	5,192½
12811 Pride 2nd—W 3	1st	5,208½	24·50	——
5046 Pallas—V 11....	9th	5,175¼	19·98	7,821½
7675 Beth—O 2	4th	5,134½	20·33	——
8223 Spot 2nd—A 1..	5th	5,098¼	26·00	6,319½
9595 Miss Tille—E 13	3rd	5,021¾	20·49	5,227½
10264 Flighty 2nd—K 15	3rd	5,005	15·21	4,373

The sixty cows which gave 5,000 lb. or over totalled 416,859½ lb. of milk; average, 6,947·65 lb. Those whose yield was 6,000 lb. and over numbered thirty-eight, and averaged 7,866·11 lb. In addition to the above were twelve which gave from 4,000 lb. to 5,000 lb.; average, 4,467·48 lb.; and five which gave from 3,000 lb. to 4,000 lb.; average, 3,598·7 lb. There were seventy-six cows in the herd which before 1899 had produced one or more calves, and during the year added another to the list, and were in full profit during a good part of the year. These seventy-six averaged 6,282·99 lb. In addition to these cows there were six heifers that came over from late 1898–97, that came in in early 1899, and twenty that came in in late 1899 as milk yielders.

Of the cows and heifers in full profit during the year, thirty-nine gave a return that was recorded 300 days or over. The famous cow, 1513 Fillpail—R 11, which was noteworthy for her heavy yield of milk, continued for two or three years, had to be slaughtered when 20 years old, being lamed by rheumatism. It will be seen from the above list that three of her daughters inherit her good qualities; fortunately they are more frequent breeders.

The imported red poll bull "Barrister," which is to be temporarily stationed at Norfolk Island, comes from the Whitlingham herd, where he was used at the stud.

PASTEURISATION.

THE Dairy Expert has received from Mr. R. Gordon, of Omega, the following letter in which the writer gives expression to opinions that are of interest to all engaged in the production of first quality butter:—"In answer to your questions *re* pasteurisation, first from the point of view as a buttermaker, I may as well admit, when the system was introduced I had but little faith in it, as the butter made under the process did not seem to me to be much better than that I had been myself accustomed to make, but I soon noticed that pasteurised butter placed for a length of time on exhibit at the shows came back in as good and as sweet condition as when first made, whereas my own butter—which was so good as to secure first awards—afterwards came back very much deteriorated, in fact, but little better than pastry quality. This set me thinking. I started to pasteurise, and the results, if only from the point of view of the keeping qualities of the butter, have been with me highly successful. Profiting since then by a much longer experience of pasteurisation, I have no hesitation in stating my belief that the process should be universally adopted throughout the Colony.

"You ask my opinion, as a practical dairy farmer, of the merits of the separated milk for feeding calves. I think there can be no divided ideas of those farmers who have tried its effect as against that of unpasteurised skimmed milk. No man who has tried it will dispute the superiority of pasteurised milk for calves, if he speaks the truth. The increased percentage of heifers allows him to sell some, whereas in time past, before the adotion of pasteurisation, he was compelled to buy heifers to keep up his stock. In this connection, my friend, Mr. H. H. Honey, of Kiama, has gone very thoroughly into the subject of pasteurised milk for calves, and I fancy it would take more than a team of horses to shift his opinion of its complete success, and my own opinion quite coincides with his.

"In winter time particularly, pasteurised milk has this advantage—that it warms the calves, and fattens them, besides keeping them in much better condition than if fed upon unpasteurised milk at ordinary cool temperature.

"The introduction of compulsory pasteurisation may appear to fall hard upon the owner of the private separator, but if the question were thoroughly inquired into it would be found that nearly the whole product of these private separators is quite unfit to go to any factory to be treated; and, in my opinion, it would be far better for the industry if dairy farmers were prevented sending the inferior cream of their private separators to any factory, which they do now to the serious detriment of the whole output of butter to that factory.

"I am informed by Mr. Pateson, of the Fresh Food and Ice Company, that his company obtains a higher price for their pasteurised butter than unpasteurised, even of the very best quality, and over the ordinary make of creamery butter the comparison is still stronger.

"I could continue at considerable length on the merits of pasteurisation, both from the point of view of the buttermaker and the milk-producer, and the good it is likely to do the dairy industry if universally adopted, and if I can be of further assistance to you, I shall be only too happy to help."

BOILED PEA-NUTS.

MR. G. R. HARRISON, of Merrylands, writes: "In the July issue (p. 620) a correspondent asks for information *re* cooking pea-nuts. During a year's residence in Warwick, Queensland, I discovered how very much superior they were when boiled with enough salt to be noticeable. The advantages of boiling over roasting are several. The operation can be carried out in the ever-handy kerosene-tin; the nuts are not rendered hard; the skins stick to the kernels and are eaten with them, while the flavour is very much improved by the addition of salt. After boiling (the time will depend upon the taste of the consumer) the nuts are spread out while hot to drain and dry."

Replies to Correspondents.

Manures for Maize.

In answer to inquiries from South Australia as to what manures have been found most suitable for maize in this Colony, Mr. Geo. Valder, Principal, H.A. College, reports :—" For many years experiments have been carried out in the poor sandy land of the College Farm at Richmond, to determine the most effective fertilisers for maize. At first very large quantities were used in the trials, but during the last two seasons the amount of manure per acre has been considerably reduced. Last season (1899-1900) was an exceptionally bad one for maize-growing, but the results confirm the opinion that the slower-acting manures, such as bone-dust and blood, give better results than the quick-acting ones; and in the large plots (of many acres) a mixture of bone-dust and dried blood, in the proportion of 2 cwt. bone-dust to 1 cwt. blood, is applied at the rate of 2 cwt. to 2½ cwt. per acre. On the richer land an even lighter dressing, say 1½ cwt. to the acre, gave very satisfactory results."

Manures for Turnips and Rape.

In reply to the same correspondent, Mr. Valder says :—" We have tried a large number of manures for these crops, and so far the best results have been obtained by using bone-dust alone on the poor sandy soils, at the rate of 2 cwt per acre; whilst on the heavier soils the same quantity of superphosphate appears to be about the best. Exceptionally heavy crops of rape are now (end of June) being harvested from land to which the above dressing was applied. In some few instances a mixture of bone-dust and blood at the rate of two to one has given even better results than the bone-dust or superphosphate alone; but, as a rule, the latter is to be preferred."

Tobacco as an Insecticide.

In answer to Mr. W. Lawlor of Sunnyside, Tenterfield, who asks for advice as to the most effective way of using tobacco (ordinary dried leaf) for insect pests, the Entomologist, Mr. W. W. Froggatt, says: It can be used in the two following ways :—For aphis, the roots of the affected trees are bared, and the tobacco, ground to powder, is dusted well over the roots and ground about them. A ring of tobacco dust is put round the trunk of the tree, just below the surface. The earth is then thrown back, and when rain comes the nicotine is washed out of the tobacco, and gets spread over the roots, killing all black or woolly aphides with which it comes in contact.

Secondly, as a wash: 1 lb. of waste tobacco will make about four gallons of wash, and ½ lb. of soap is added to make it more adhesive. The leaf can be steeped in cold water overnight, and the soap boiled up and added; but most orchardists boil up the leaf and soap together, straining the resulting liquor and applying it hot. Tobacco is a contact poison, and is the best known remedy for soft-bodied things like aphides, but it does not affect scale insects very much, when they are full grown and protected by their shelly outer covering. If tobacco wash could be sprayed on to the larvæ of scale insects it would destroy them wholesale.

Some Questions of Importance to Vine-growers and Orchardists.

Mr. Joseph Doust, of Oldham Hill, Camden, has submitted the following questions, to which the subjoined answers by Messrs. Allen and Blunno may be of interest and value to cultivators generally. Mr. Doust has about 4 acres of vines and 8 acres of fruit-trees.

Vines.

1. I should like your opinion as to whether, for vines which are now very healthy-looking, the smaller quantities (*a*) of fertilisers would be sufficient. The formula in question gives:

Superphosphate of lime (*a*) 1 cwt. 2 qrs. to (*b*) 3 cwt. per acre.
Sulphate of potash (*a*) 1 cwt. 1 qr. to (*b*) 2 cwt. 2 qrs.
Nitrate of soda (*a*) 1 cwt. 2 qrs. to (*b*) 2 cwt. 3 qrs.
Gypsum (*a*) 2 cwt. 2 qr. to (*b*) 4 cwt.

Answer: If the vines are vigorous and the soil is naturally fairly rich, the smaller rate of fertilisers suggested will be sufficient. The superphosphate and gypsum should be applied in winter, the sulphate of potash a little later (towards the end of winter), and the nitrate of soda very lightly raked in at the beginning of spring.

2. Would lime be of any benefit? My land—a good red clay, not over stiff—has never had any lime.

Answer: In the case of vines, the gypsum in the formula would take the place of lime, and produce the same good results.

3. Would sheep manure be good for the vines?

Answer: Sheep manure, properly rotted and applied to the vineyard in autumn, is a splendid fertiliser, particularly rich in nitrogen; but the results of manuring can be better controlled by the use of commercial fertilisers.

4. Which would be the best for black spot on grapes—sulphate of iron by itself, sulphuric acid by itself, or a mixture of the two?

Answer: A solution of ⅔ of a pint of sulphuric acid in one gallon water is an effective preventive against black spot of the vine. A solution of sulphate of iron alone in water is not effective. Sulphate of iron added to the above said solution of sulphuric acid in water, would not make the latter remedy any more effective. It would be well to swab not only the young wood and the horizontal branches, but the stem down to the ground as well, after having removed the particles of old bark by rubbing with a piece of sacking Such treatment would destroy insects and eggs as well as germs of fungoid disease harbouring under the rough bark. It may be added that sulphate of iron is not a manure in the proper sense. It is used to modify certain chemical qualities of the soil when it is too rich in limestone, and vines may in consequence be affected by the so-called *clorosis* (yellow leaves). But as such is not the case at Mr. Doust's vineyard, there is really nothing to be gained by the application of sulphate of iron.

Orchard.

(*a.*) When should manures be applied in the orchard? What quantity of sheep manure per acre is it best to use on clay land like mine?

Mr. Allen reports: If the orchard is to be manured with horse or sheep manure, it is best to put it on just before ploughing—early in autumn, or during winter (say not later than latter part of July). Two tons of sheep manure would be a medium dressing per acre per annum, and it will be found well to use this at least every third year, using commercial fertilisers, as recommended in Mr. Guthrie's formulæ, in small quantities, for direct application to the trees the year when sheep or other similar manure is not used.

Dead Pigs in a Litter.

In reply to Mr. V. D. Cox, of Burrundulla, Mudgee, as to the reason why a sow has on successive occasions three or four dead pigs in a litter, Mr. George Valder, Principal Hawkesbury Agricultural College, states that the trouble is generally caused by some injury to the sow received during pregnancy. It is often caused by the sows fighting or by strange pigs getting in with them.

AGRICULTURAL SOCIETIES' SHOWS, 1900.

Society.	Secretary.	Date.
Dapto A. and H. Society	A. B. Chippindall	Jan., 10, 11
Thornleigh and District Horticultural Association	Fred. N. Brack	,, 13
Albion Park A. and H. Association	H. Fryer	,, 17, 18
Kiama Agricultural Association	James Somerville	,, 25, 26
Gosford A. and H. Association	W. McIntyre	,, 26, 27
Wollongong Agricultural Association	J. A. Beatson	,, 31, Feb., 1, 2
Agricultural and Horticultural Society, Shoalhaven	R. Leeming	,, 8, 9
Manning River (Taree) A. and H. Association	W. Plummer	,, 9, 10
Alstonville Agricultural Society	N. R. Elvery	,, 14, 15
Moruya A. and P. Society	John Jeffery	,, 14, 15
Lithgow Agricul., Horticul., and Produce Society	M. Asher	,, 15, 16
Ulladulla A. and H. Association	C. A. Cork	,, 21, 22
Tumut Agricultural and Pastoral Association	M. McNamara	,, 21, 22
Central Richmond River Agricultural Society	D. Cameron	,, 22, 23
Cobargo A., P., and H. Society	T. Kennelly	Mar. 1, 2
Robertson Agricultural Society	R. E. Ferguson	,, 1, 2
Berrigan A. and H. Society	R. Drummond	,, 7
Canowindra P., A., and H. Association	A. E. Smith	,, 7
Tenterfield I. P., A., and M. Society, Show	T. W. Hoskin	,, 6, 7, 8
,, ,, Fair days	,,	,, 9, 10
Candelo A. Association	C. H. Brooks	,, 7, 8
Campbelltown A., H., and I. Society	A. R. Payten	,, 7, 8
Walcha Pastoral and Agricultural Association	F. Townshend	,, 8, 9
Oberon A., H., and P. Association	Alf. Gale	,, 8, 9
Port Macquarie and Hastings District A. and H. Society	J. Y. Butler	,, 8, 9
Berrima District A., H., and I. Society (Moss Vale)	James Yeo	,, 8, 9, 10
Campbelltown A., H., and I. Society	A. R. Payten	,, 9, 10
Lismore A. and I. Society	T. W. Hewitt	,, 7, 8
Cudal A. and P. Society	C. Schramme	,, 14
Bega A., P., and H. Society	J. Underhill	,, 14, 15
Central New England (Glen Innes) P. and A. Assoc.	John Priest	,, 14, 15, 16
Nepean District A., H., and I. Society	E. K. Waldron	,, 14, 15, 16
Macleay (Kempsey) A., H., and I. Association	E. Weeks	,, 14, 15, 16
Goulburn A., P., and H. Society	J. J. Roberts	,, 15, 16
Cumnock P., A., and H. Association	W. L. Ross	,, 20, 21
Bombala Exhibition Society	R. H. Cook	,, 20, 21
Armidale and New England P., A., and H. Association	W. H. Allingham	,, 20, 21, 22
Mudgee Agricultural Society	J. M. Cox	,, 21, 22, 23
Inverell A. and P. Society	J. McGregor	,, 21, 22, 23
Camden A., H., and I. Society	C. A. Thompson	,, 21, 22, 23
Crookwell P. and A. Association	J. W. P. Levy	,, 22, 23
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28, 29
Clarence P. and A. Society (Grafton)	J. C. Wilcox	Mar. 28, 29
Blayney A. and P. Association	H. Woolley	,, 28, 29
Gundagai P., A., H., and I. Society	A. Elworthy	,, 29, 30
Lower Clarence (Maclean) Agricultural Society	Geo. Davis	April 3, 4
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 4, 5
Cooma P. and A. Association	C. J. Walmsley	,, 4, 5
Upper Hunter (Muswellbrook) P. and A. Association	J. C. Luscombe	... *
Orange A. and P. Association	W. Tanner, junr.	April 4, 5, 6
Warialda P. and A. Association	W. B. Geddes	,, 4, 5
Royal Agricultural Society of New South Wales (Sydney)	F. Webster	,, 11-21
Rylstone H. and A. Society	W. Taylor	,, 25, 26
Bathurst A., H., and P. Association	W. G. Thompson	,, 25, 26, 27
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	,, 25, 26, 27
Wellington P. and A. Society	James Thompson	May 2, 3
Moree P. and A. Society	S. L. Cohen	,, 2, 3, 4

Society.	Secretary.	Date.
Upper Manning A. and H. Association, Wingham	Wm. Dimond	May 3, 4
Durham (Dungog) A. and H. Association	C. E. Grant	,, 9, 10
Richmond River A., H., and P. Society (Casino)	Jas. T. Tandy	,, 10, 11
Hawkesbury District A. Association (Richmond)	C. S. Guest	,, 10, 11, 12
Gunnedah P., A., and H. Association	J. H. King	,, 15, 16, 17
Nyngan A. and P. Society	J. C. Cahill	,, 16, 17
Coonamble P. and A. Association	F. C. Lamotte	,, 23, 24
Deniliquin P. and A. Society	H. J. Wooldridge	July 19, 20†
Wentworth P. A., and I. Society	J. W. Thorn	,, 18
Riverina P. and A. Association (Jerilderie)	Wm. Elliott	,, 24, 25
Hay P. and A. Society	G. S. Camden	,, 25, 26
Condobolin P and A. Association	D. H. Tasker	,, 25, 26
Balranald P. and A. Society	— Murray	Aug. 1
Forbes P. A. and H. Association	N. A. Read	,, 1, 2
Parkes P. and A. Association	G. W. Seaborn	,, 8, 9
Lachlan Pastoral and Agricultural Association (Hillston)	Thos. Cadell	,, 10
Corowa P. A. and H. Society	E. L. Archer	,, 14, 15
Gunnedah P. A., and H. Association	J. H. King	,, 21, 22
Cootamundra A., P., H., and I. Association	Thos. Williams	,, 28, 29, 30
Northern Agricultural Association, Singleton	Ch. Poppenhagen	,, 29, 30, 31
Murrumbidgee P. and A. Association (Wagga Wagga)	R. E. Shorter	Sept. 5, 6
Grenfell P., A., and H. Association	Geo. Cousins	,, 5, 6
Manildra P. and A. Association	G. W. Griffith	,, 5
Albury and Border P., A., and H. Society	Geo. E. Mackay	,, 12, 13
Burrangong P. and A. Association (Young)	Geo. Ward	,, 12, 13
Yass P. and A. Association	F. C. Mackintosh	,, 13, 14
Moama A. and P. Association	C. L. Blair	,, 19
Cowra P., A., and H. Association	H. Smith	,, 19, 20
Junee P., A., and I. Association	G. W. Scrivener	,, 19, 20
Burrowa P., A., and H. Association	Fred. H. Trout	,, 21, 22
Millthorpe Agricultural Association	S. C. Francis	,, 25, 26§
Temora P., A., H., and I. Association	W. H. Tubman	,, 26, 27
Germanton P. A. and H. Society	G. T. S. Wilson	,, 26, 27
Tweed, Brunswick, and Border P. and A. Society (Murwillumbah)	R. Campbell	Nov. 28, 29

1901.

Society.	Secretary.	Date.
Dapto A. and H. Society	A. B. Chippindall	Jan. 9, 10
Berry Agricultural Society	A. J. Colley	,, 22, 23, 24
Wollongong A. and I. Association	J. A. Beatson	Jan. 31, Feb. 1, 2
Kiama A. Association	Jas. Somerville	,, 26, 28
Alstonville Agricultural Society	Henry R. Elvery	Feb. 26, 27
Tenterfield Intercolonial, P., A., and M. Society	F. W. Hoskin	Mar. 5, 6, 7‡
Berrima District A., H., and I Society (Moss Vale)	Jas. Yeo	,, 7, 8, 9
Central New England (Glen Innes) P. and A. Assoc.	Geo. A. Priest	,, 12, 13, 14
Crookwell P. and A. Association	M. P. Levy	,, 21, 22
Inverell P. and A. Association	T. P. Borthwick	,, 20, 21, 22
Upper Hunter P. and A. Association (Muswellbrook)	J. C. Luscombe	,, 27, 28, 29
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	Apr. 17, 18, 19
Orange A. and P. Association	W. Tanner, jun.	April 25, 26

* Show postponed till 1901. † Sheep Dog Trial, 23 May. ‡ Fair Days, March 8, 9.
§ Show and Intercolonial Champion Ploughing.

[23 plates.]

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Culture

Vol. XI. Part 9. *SEPTEMBER.*

Lemon Culture in Italy.

During his recent tour of the Continent, Mr. Hugh Dixson, President of Messrs. Dixson and Sons (Limited), was good enough to keep a lookout for anything likely to be of interest to readers of the *Agricultural Gazette*. Several valuable contributions from his pen have already appeared in these pages, and the Department has now the pleasure of reproducing the following notes, which Mr. Dixson jotted down during a trip through one of the principal lemon-growing districts of Italy.

Lemons.

The district round the Gulf of Salerno, near Naples, Italy, is largely devoted to the growth of lemons for export, and as I had not seen trees treated in the way they were I was much interested.

The trees, as well as the lemons, are invariably very closely shaded on the top, and where they are high also at the sides. This is also the case where the sun and wind can get at low trees from their position on the hillsides. In some instances where the trees are relatively low, poles, as posts, 7 or 8 feet out of the ground, are used, horizontal poles being fastened to the top. To these the limbs of the trees carrying the fruit shortly after setting are bent down and tied, not necessarily lengthwise but crosswise and slantingly or anglewise. I saw several branches that had partly broken as the result at the bend. Thus the whole framework was like a green bush-house, but with the non-fruiting branches and young growths, often 6 feet high, standing above, and the fruit by its weight hanging below, completely sheltered from the sun, or liability of being knocked off by the wind. There were, so far as I saw, no cross horizontal poles, the limbs answering the purpose sufficiently. In other cases, and more generally, the horizontal poles were 15 to 20 feet or even more above the ground.

I measured some uprights I saw lying on the ground up to 30 feet long, just like very long clothes props, 3 to 4 inches thick at the bottom, and with the forks left on near the top, on which to tie or to carry the horizontal poles. They were all lengths, from 10 feet upwards.

The uprights were 8 or 10 feet apart the way the horizontals laid, but only 4 feet apart the other way, so that the horizontals were only 4 feet apart. Where the poles were high the trees were, so far as I was able to judge, not fastened to the horizontals at any rate, but I had not the opportunity of walking through or examining closely, as in the case of the lower ones. The high horizontals were covered with long grass or straw mats and brushwood, and when the fruit was gathered the covering was removed and stacked on the top of the horizontals to preserve them for the next season and looked like little tents spread over the gardens. Very commonly, and especially on the exposed sides, chiefly, I think, as wind shelter, straw mats are used. They appeared to be 4 to 5 feet wide, made by laying down three strips of split wood, like the narrow wood-hoops sometimes seen on French spirit casks, about 18 inches apart, over which straw was laid, thinly, closely, evenly, and straight, but extending beyond the laths, 9 to 12 inches on each side, with three laths on the top of the former laid over the straw and nailed through from lath to lath. To carry these horizontals poles were fastened down the sides of the uprights, and as a rule the mats were fastened to these with the laths up and down. The sides were fully half as much again more sheltered than is the side of an ordinary bush-house with us, and the tops quite as much so if not more. As I could not speak Italian I had to depend upon such information as the guide with us could give me, and he said it was "to shelter the fruit from the sun and frost." There can be no doubt the side shelters also were for wind and possibly sun.

The advantages of this treatment appeared to me to be:—

1. That it allowed all the rain to pass through and be conserved from evaporation in a district where it would pass off very rapidly otherwise,
2. The fruit would be kept growing till much larger than otherwise.
3. (and chiefly) The fruit, which is valued for its acid properties, would not sweeten at all.

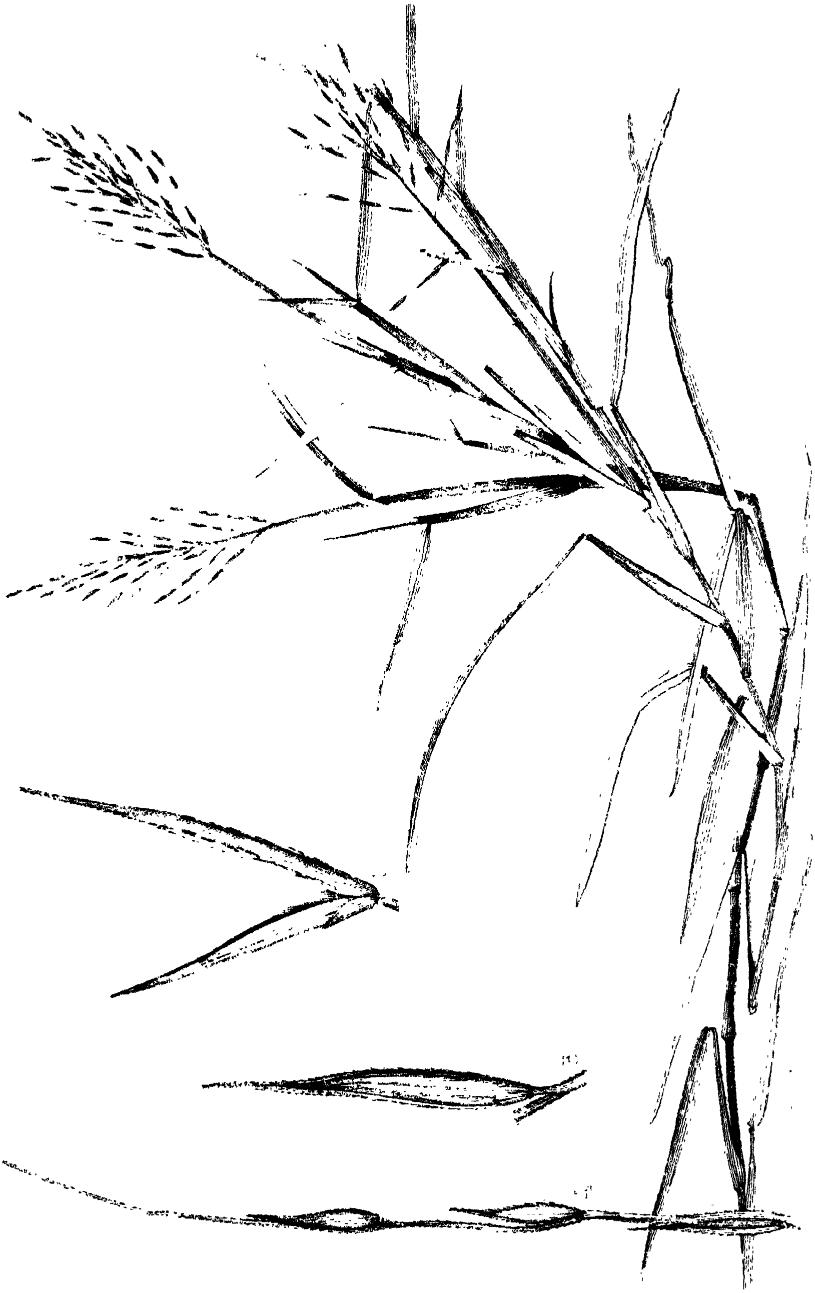
For the information of readers who do not know even by repute this part of Italy, I may say these lemon groves are very largely on the sides of steep hills, quite as steep or steeper than a stairs. The roads are long zig-zags, on the upper side a wall 3 to 10 feet in height or more, and behind which is soil in which the trees are planted; on the lower side a low parapet wall to prevent accidents, and the grove 10, 15, or 20 feet below you.

Miles and miles of hill sides are thus terraced. Sometimes it is only a patch of a few (10 or 15) feet square carrying two or three trees, and seldom over an acre in extent, though occasionally on more favourable positions even more than 10 acres in extent; generally where this is the case olives are grown. The hills are all limestone.

I saw quite a variety of materials used for the covering—straw, brushwood from the hillsides, vine cuttings, and in one or two cases long sawn palings. But the people are poor and labour a mere song.

The lemon and orange trees are 8 to 10 feet apart.

Oranges were occasionally found treated in the same way as lemons, but not so closely sheltered.



CHAMÆRAPHIS SPINESCENS, Poir.

A, *a branch of the panicle.* B, *Spikelet, with part of panicle-branch* C, *Spikelet, open*

Useful Australian Plants.

By J. H. MAIDEN.

No. 65.—*Chamæraphis spinescens*, Poir.

Botanical name.—*Chamaraphis*, Greek; *chamai*, for "on the ground," and *raphis*, a needle, referring to the awn-like point of the *rhachis*; *spinescens*, derived from the Latin; spina, a thorn or prickle, having much the meaning of *raphis* in the present connection.

Synonym.—*Panicum spinescens*, R. Br.

Botanical description (B. Fl., vii, 498) :—

Stems creeping at the base, and when in water forming large floating masses.

Leaves linear-lanceolate, flat, with loose flattened sheaths, quite smooth, or slightly scabrous.

Panicle, 2 to 4 inches long, with rather numerous filiform, flexuose, spreading branches produced beyond the last spikelet into an awn-like point always longer than the spikelet.

Spikelets, few on each branch, distant shortly pedicellate, but closely appressed in each bend of the rhachis, very narrow, about 3 lines long in the typical form.

Pedicels and rhachis usually minutely scabrous-ciliate.

Outer glume about half line long, thinly membranous, the second many-nerved, tapering to a long point; the third usually rather smaller, with a shorter point and fewer nerves, enclosing the male flower.

Fruiting glume much shorter, obtuse, very thin, and remaining thin as well as the palea over the grain which readily falls out of them.

Value as a fodder.—A creeping grass found near water; forms a good sward, covering the land as the water recedes in waterholes (Bailey). Believed to be nutritious; stock eat it readily.

Habitat and range.—A semi-aquatic, found in all the colonies except Tasmania; and, as regards our own Colony, from the Coast districts on the ranges and table-lands to the driest districts found also in Asia.

Reference to Plate.

A. A branch of the panicle.
B. Spikelets with part of panicle branch.
C. Spikelet, open.

The Jersey Cow.

INFLUENCE OF FOOD ON MILK; TUBERCULOSIS.*

J. S. RUTTER.

THE reading of different papers delivered at the monthly meetings on dairying and the improvement of dairy stock, tempts me to pen the following brief article.

I have been greatly surprised at the aversion of Hunter River farmers to the Jersey cow, and I think a little of its history from other places might perhaps do a little towards altering the false impressions the dairymen seem to have. As far back as 1860 and up to the present time importations of Jersey cattle have been going on in America on an average of 1,000 head per year, some years reaching 2,000 or more. They have bred so numerously and been so largely used for grading, and have proved so remarkably well adapted to a wide range of climate, that the characteristic markings of no other breed can be so frequently seen wherever dairy cows are kept. Jerseys are among the smallest in average size of the noted dairy breeds—cows ranging from 700 to 1,000 and bulls from 1,200 to 1,800 lb., and where efforts have been made to build up a herd of larger size an average of over 1,000 lb. for mature cows has been easily attained. Some people think that Jerseys to be pure should have no white markings; this is erroneous, as a matter of fact eight out of every ten registered in the herd book on the Island of Jersey have white markings. Again, the name Alderney is a misnomer. Practically speaking there is no breed of Alderneys. The cattle on the Island of Alderney are crossed and re-crossed with Jersey and Guernsey so that all individuality has been lost.

In this article I shall draw largely from the American papers—*The Jersey Bulletin and Hoard's Dairyman*—as I contend what has been done in one country can be done in another under similar surroundings and conditions. Why are the Hunter River farmers prejudiced against the Jerseys? Because one man tells you they are delicate, not hardy, more subject to have tuberculosis, and are too small for beef, etc., etc. When I come to speak to these men I find that three out of every four have never kept pure-bred Jerseys, and the other one has had a few half-breds, and poor ones at that, and so runs them down as worthless. "When you find a man that is unfriendly to the Jersey it is a sure sign that his judgment is based on experience with animals which are not average representatives of the breed."

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* **Read at the twentieth Monthly Reading of the Hunter River Agricultural and Horticultural Association, West Maitland.**

Now let me say right here to start with, we must have a thoroughbred dairyman to run the show; the man that was born tired had better leave the dairy to the other chap. If you wish for uniformity and good performance you must have thorough-breds. You can take the best cows you can find of no distinct breeding and mate them to a good pure-bred sire that has every desirable quality in himself, and his ancestors of the very best for five or six or more generations back, and if mated right the chances are you will get an improvement on the original cows, but seven times out of ten it stops with the first cross. Why? Simply because the cows you started with have not had the good qualities bred into them as a pure-bred has. Now reverse things and put a half-bred bull on the best pure-bred cows and you simply have a lottery—a very few prizes and a considerable number of blanks. It stands to reason that a pure-bred animal must be able to transmit his or her good qualities better than a cross-bred.

As to the relative position of the three most popular breeds of dairy cattle I cannot do better than quote the records of the Columbian Exposition, held in Chicago, at which about 200 head of cows competed in public for test of cheese and butter for thirty days, also ninety days. The three breeds that entered were Jersey, Guernsey, and Shorthorn. In the cheese test for fifteen days twenty-five head of each breed competed.

Jerseys gave 13,296 lb. milk, and 1,451 lb. cheese; profit 119 dols.

Guernseys gave 10,938 lb. milk, and 1,130 lb. cheese; profit 88 dols.

Shorthorns gave 12,186 lb. milk, and 1,077 lb. cheese; profit 81 dols.

Butter test for ninety days, twenty-five cows of each breed competed:—

Jerseys gave 73,488 lb. milk, producing 4,274 lb. butter; net gain 1,323 dols.

Guernseys gave 61,781 lb. milk, producing 3,360 lb. butter; net gain 997 dols.

Shorthorns gave 66,263 lb. milk, producing 2,890 lb. butter; net gain 910 dols.

Butter test for thirty days, fifteen cows of each breed competed:—

Jerseys gave 13,921 lb. milk, producing 837 lb. butter; requiring 16·63 lb. of milk to 1 lb. butter.

Guernseys gave 13,518 lb. milk, producing 724 lb. butter; requiring 18·67 lb. of milk to 1 lb. butter.

Shorthorns gave 15,618 lb. milk, producing 662 lb. butter; requiring 23·57 lb. milk to 1 lb. butter.

Now take the best cow in each breed. Cheese test for fifteen days:—

Jersey "Ida Marigold" gave 674 lb. milk, producing 70 lb.

Guernsey "Sweet Ada" gave 535 lb. milk, producing 54 lb.

Shorthorn "Nora" gave 663 lb. milk, producing 60 lb. cheese.

Butter test for ninety days:—

Jersey "Brown Bessie" gave 3,634 lb. milk, producing 217 lb. butter; net profit 73 dols.

Guernsey "Materna" gave 3,512 lb. milk, producing 185 lb. butter; net profit 57 dols.

Shorthorn "Nora" gave 3,680 lb. milk, producing 166 lb. butter; net profit 52 dols.

Butter test for thirty days:—

Jersey "Brown Bessie" gave 72 lb. butter.

Guernsey "Purity" gave 54 lb. butter.

Shorthorn "Kitty Clay 4th" gave 62 lb. butter.

You will see by the above tests that the Jerseys beat both other breeds in the quantity of milk produced, in three different tests over the shorthorns, and in all five tests over the Guernseys; the Jerseys beating both in butter and cheese, also in cost of production in every respect. Are the above solid facts enough proof that the Jerseys are very well able to hold their own?

The following is written by Mr. B. Ames in the *Jersey Bulletin*, of January 3, of the present year:—"The time has passed in which a cow brought a big price solely because she was beautiful to look upon, or because she first saw the light of day upon the lovely Island of Jersey. What we seek to-day is individual merit, basing our expectation, when the same has not been fully demonstrated, upon the type of the individual and her environments, but chiefly upon what her ancestors, immediate and remote, have shown themselves capable of accomplishing."

A perusal of the volume entitled *Butter Tests of registered Jersey Cows*, up to August 1st, 1898, published by the American Jersey Cattle Club, is both interesting and instructive; interesting to all lovers of the cow as showing the individual capacity of certain members of the bovine family; instructive, as showing and proving to all the capacity of the Jersey cow to produce, in pounds and ounces, that article of commerce known as butter, in the greatest quantity at the least cost. Such, indeed I take it, is the true function of the dairy cow. A Jersey cow to be in "the list" must produce 14 lb. of merchantable butter in seven days. No breed of cattle on earth can show as many producing animals as can the Jerseys. And the following figures will bear me out in this assertion:—Up to that date 3,524 animals had entered the list by producing 14 lb. of merchantable butter in seven days. One had produced 46 lb.

12½ oz., one 39 lb. 12 oz., one 36 lb. 12¼ oz., one 35 lb. 1 oz., two between 34 and 35 lb., five between 30 and 35 lb., forty-eight between 25 and 30 lb., and twenty-eight had produced 24 lb. and under 25 lb.

50	had produced	between	23 and 24 lb.
61	,,	,,	22 and 23 lb.
106	,,	,,	21 and 22 lb.
128	,,	,,	20 and 21 lb.
148	,,	,,	19 and 20 lb.
282	,,	,,	18 and 19 lb.
400	,,	,,	17 and 18 lb.
589	,,	,,	16 and 17 lb.
767	,,	,,	15 and 16 lb.
906	,,	,,	14 and 15 lb.

Eleven had made authentic records of over 571 lb. for a year; twenty-six of over 120 lb. in ninety days, and forty of over 55 lb. in a month. Should this list be brought up to date the number in all classes would be greatly increased; but as it stands it proves that one breed of cattle has produced from its own ranks more animals of merit at the churn than all other breeds combined.

In this age of corporate enterprise, intensified production, and intelligent management, no one can attain success in any pursuit without modern appliances and the best methods. Horse cars are as much out of place on a modern street railway as the "general purpose" cow is in a modern dairy. At the present time it is estimated that over 1,000 herds of Jerseys can be found in New York alone.

In an article read by Mr. A. Williams, of Tarro, he says, "He trusts our farmers are prepared to be guided by results rather than by breeds." I corroborate this statement, and hope you Hunter River farmers will read and digest the above results. Mr. Williams gives you no results of Durhams. He then goes on to speak about the constitution of Jerseys. The Jerseys as a breed are not dainty in any sense of the word. Can a cow be called dainty that will eat food enough to make over 16,700 lb. of milk in a year? Could "Mary Anne of St. Lambert" have been a dainty cow to eat 27 lb. of grain per day and make 36 lb. of butter in seven days? No; the Jerseys as a breed have grand constitutions, good appetites, and wonderful digestion. What is hardiness? The proper test of hardiness as applied to cattle is that they shall be able to live, thrive, and do their appointed work under such conditions, such feeding, care and protection, as successful cattle-breeders give to other cattle in the given locality. Jersey cattle in large numbers are now kept in all parts of the world. Under all the various conditions of climate prevailing in every locality the Jersey has thrived and is steadily growing in popularity. They are breeding and feeding as well and doing more work in the dairy than any other breed. Judged by any reasonable rule they are as hardy as any dairy cattle in the world.

In the nature of things, good dairy cattle are not "rustlers." The proper performance of the work they have to do, requires that they shall have their food provided for them, and that they shall not be asked to rough it in all sorts of weather. Profitable milk-making demands that the cow shall be kept comfortable and be provided with a bountiful supply of nutritious food. The dairy cow is altogether an artificial product—the result of comfortable conditions and bountiful food through many generations—and, in my opinion, the Jersey cow is the highest product of the art and skill of man in breeding and feeding cattle for milk and its products. In the sense of being able to do work and keep it up for many years, no breed of cattle is more hardy than the Jersey.

Statistics that have been compiled in the U.S., America, show 3 per cent. of Jerseys have tuberculosis, while 7 per cent. of Durhams have it. On the islands of Jersey and Guernsey they have yet to find one beast with tuberculosis. Can Mr. Williams say this of the Durhams on the South Coast? Mr. Williams thinks the Jerseys are inclined to be too small. I have already given the average weight on the Island, but here is a little more proof. The Jersey cow "Rose," owned by A. M. Bowman (weight 1,000 lb.) milked 40 lb. a day with her last calf, dropped when she was 17 years old, and made 16¼ lb. of butter in seven days when she was 14 years old. Mel's Princess when 11 years old, weighed 1,120 lb., and gave 18 lb. 2 oz. of marketable butter. The average weight of Jerseys that are producers in America exceed 700 lb. Are these too small? Mr. Williams runs the Jerseys down to the very lowest, and admits that he never kept any pure-breds. What reliance can you place on a man's testimony when he has had no experience with full-bloods—because he kept a few half-breds, and perchance scrubs at that. What proof has he either for or against Jerseys? He also emphasised the point of not breeding until the beast is 3 years old, and then admits breeding his half-breds at 14 months. Was this the fault of the Jerseys or Mr. Williams? "The Jersey cow is like an ardent lover—she comes early (if allowed) and stays late." Mr. Williams then attacks the Government saying "they made an effort to encourage the breeders to improve their stock, but their terms do not seem to meet with the approval of the farmers." In my opinion the thanks of the breeders and farmers are due to the Department that instigated this object, and the dairyman that begrudges 10s. or 15s. for the service of these bulls had better give up dairying at once, and go in for rearing vealers with any scrub of a bull, as neither form nor quality is looked for. I might say that one of the Government bulls "Golden King" is now stationed at Armidale, and a better beast it would be hard to find. He is almost if not quite a model, and had he been placed in the ring at your late show would certainly have put the whole of the 3-year-old class greatly in the shade. At the turn of spring I anticipate a big rush for his services, judging by the number of enquiries. One of his yearling sons is pronounced by competent judges to be the best young bull at the present time in Australia. I venture to say that if "Golden King" was standing for service in England or America, his fee would be 3 guineas or over, against

10s. in Armidale. The Durhams do not carry the record as milkers, as Mr. Williams affirms; they did not beat the Jerseys at the World's Fair even in this respect. If I am not mistaken, the Ayrshires and Holsteins hold the record for quantity of milk; but what butter-fat tests have they? It is a very rare beast that reaches 4 per cent., while the Jerseys are oftener above 5 per cent. than they are below it.

Mr. J. O. Johnson, secretary of the Michigan Jersey Cattle Club, has a herd of 40 pure-bred Jerseys, which averaged 6,306 lb. of milk per cow last year, with an average test of over 6 per cent. butter-fat. "Monett's Dido," a Jersey heifer, averaged 8·8 for the week while being tested, and her stable companion averaged 9·2. The cow "Jimp" tested 11·0 on the show-grounds, which was tested and sworn to by the public tester, Dr. C. C. McLean, V.S., Philadelphia. It is estimated that there are 90,000 registered Jerseys alive in America, besides thousands of pure-breds not registered, and hundreds of thousands of grades. The blood of this breed is more generally diffused and more highly prized than any other in the active butter-producing districts of the United States. The Jersey as a breed leads all others in economy of production, which must not be lost sight of. We are not competing with the cow's products in our own local markets only: we are competing against the world. A good illustration of this is shown in the accompanying returns which speak for themselves. Grade Jersey cow, "Nan," property of the Wisconsin Experiment Station. Yield of milk for year, 6,643 lb.; butter, 405·95 lb. Value of feed consumed, 29·27 dollars. Profit over cost of feed, 62·38 dollars. Cost of butter per lb., 7·2 cents. Grade Guernsey cow, "Dolly," property of the Wisconsin Experiment Station. Yield of milk for year, 1925·5 lb.; butter, 110·90 lb. Value of feed consumed, 24·74 dollars; profit over cost of feed, 7 cents; cost of butter per lb., 24 cents.

The two most formidable things in my mind that a breeder has to contend with are droughts and bad bulls. I have had five years' bitter experience of this combination, so know whereof I speak. There is an old saying, "The bull is half the herd." I will go further than this, and place him midway between success and failure—success if he is good and mated to good stock, failure if bad. I will venture to say (with all due respect to the breeders who competed at your late show) that not one of the bulls shown in the 3-year-old class, mated with any one of the four best cows in the ring, would produce a heifer as good as her dam in every respect. Too much care cannot be taken in selecting the bull.

The Influence of Food on Milk.

I notice Mr. Williams speaks very highly of *paspalum* as a milk-producer, which it no doubt is for securing a large flow of milk, but I think he is in error in saying it increases the percentage of butter-fat. You can alter the composition of milk for a short period only, when the milk will return to its normal quality again. No food, however concentrated, can alter the quality of milk, providing the cow is in a normal condition and receiving her proper amount of nourishment.

A simple test of this assertion is easily arrived at, viz., take any herd of cows that are being fed and cared for under exactly the same conditions, and it will be hard to find three giving the same fat test. If food was capable of increasing the percentage of fat why does not every cow give the same percentage when fed the same food?

At the Cornell Experiment Station, Prof. Wing fed beef tallow to the amount of 2 lb. per day, in addition to 8 lb. grain, and on good pasture. This trial was continued for twelve months.

Cow No. 1 commenced with a yield of 47·2 lb. milk per day testing 3·5.

At the end of the 12th week had a yield of 41·2 lb. milk per day testing 3·5.

Cow No. 2 commenced with a yield of 25·9 lb. milk per day testing 4·4.

At the end of the 12th week had a yield of 21·3 lb. milk per day testing 4·3.

Professor Friis, of the Copenhagen Station, Denmark, writes:—"In the comparative feeding trials with milch cows now conducted for several years by this station, in which 1,639 cows have been included (separated into 161 lots on ten estates in different parts of our country) it has been repeatedly found that the changes made in the feed of the lots have practically had no influence on the chemical composition of the milk. In these experiments grain has been fed against roots, against oil-cake, and against wheat, bran, and shorts; grain and oil-cake have been fed against roots, and roots have been fed as additional food."

Professor Henry, of the Wisconsin Experiment Station, United States of America, writes:—"The dairyman who wishes to improve the quality of his milk must look to breed rather than to the character of the feed—within the breed he must select those animals shown by the fat-test to yield high percentages of the desired ingredient. Securing suitable animals he will reach the quantity of fat sought by supplying his cows with rations ample in quantity, rich in digestible components, and altogether palatable and wholesome."

There is absolutely only one way to increase the percentage of butter-fat, and that is by breeding it into the beast two or three years before it is born, and there is no breed in the world better able to do it than that breed which is found inside the sleek mellow hide of the poor man's pet—the rich man's pride—the Jersey.

Tuberculosis.

Before closing this article I will give you a cutting from *Hoard's Dairyman,* written by John Gould, one of America's ablest writers on agricultural topics (which is the very latest on the above question):—"The tone of the discussions and the atmosphere of New York over the tuberculosis question has radically changed in a year, and the old cow has again a reasonable tenure upon life. The great tuberculosis investigation the past summer, under the charge of the Hon. D. P.

Witter, at the instance of the legislature, has changed the complexion of the disease greatly, and settled a great many things and shown that some of the most important things known about tuberculosis were not facts. The mass of testimony was very contradictory. No two men—and the best in the United States were summoned—could agree upon the reason of a rise of temperature when tuberculin was injected. It could not be proven that the disease was transmissible from animal to man, or the reverse. The incidents to prove this were regarded as wholly wanting in specific detail. Massachusetts, where the disease is greatest among cattle, shows rapidly diminishing cases of consumption among humans. Dr. Edward Moore and Dr. Smead are challenging doctors and 'authorities' to show a single case of transmission, and even the reliability of the tuberculin test. It seems to be admitted that the days of general slaughter are over and sanitation substituted."

I might add that not very long ago some cattle were injected with tuberculin, and on reacting were slaughtered, and on examination were found to have "nodular disease" of the bowels and not a trace of tuberculosis. I think this proves that tuberculin is not reliable. With this paper I also send a few illustrations of noted Jerseys, which may be of interest to some of your members. Mr. Bishop, who has kindly consented to read this paper, will be able to answer any questions in my absence, and if any point is thought to be worthy of being referred back to me, I shall deem it an honour to answer same to the best of my ability.

Discussion.

The Chairman (Mr. R. F. Graham) said none of them wondered, seeing the illustrations that accompanied Mr. Rutter's paper, at the marvellous milking records of cows that he had given. When they saw the class of cattle that gave these results they ceased to wonder. Mr. Rutter's paper was a valuable one; but the actual benefit and value of these readings, he considered, were in their being debated and questions asked upon them.

Mr. Jas. Goldie (Duckenfield) said, after hearing Mr. Rutter's valuable paper, he did not think there was very much to add to it. The writer was of the same way of thinking on two points as himself—that was in reference to the butter-fat business and the using of the very best sire that could be got. They did not place as much importance on the sire as they should do in getting a dairy-herd together. If they wanted to increase the fat in the milk they would have to do it in the breed. They could feed to increase the flow of milk, but they could not increase the butter-fat by feeding. Of course they should, in making tests, try to get a proper scientific test. That was to say, it would not do to bring in a cow from barren ground and then put her on rich food or pastures; but the cow must be fed up to her ordinary capacity. A cow was like a machine. If not worked up to its full capacity half the power remained idle. Farmers made a great mistake in getting a number of cows instead of getting more feed. He had often passed places and, looking at the dairy-herd, thought to himself that if the farmer had got one good cow for every three he kept he would get more milk and more butter. He had known farmers to feed their cows on oats and hay, and they said it did not make any difference in their butter returns. But he told one, "When the cold weather comes on you and I put on warm overcoats, but we don't seem to think of our cows; we put them into the paddock just the same; they have to weather the blast without any extra shelter." If they did not house or rug their cattle that they would have to give feed that would not only keep up the heat of the body but also for that required to make the milk. As Mr. Rutter said in his paper, Jersey cattle wanted to be well fed and well treated to get the results he mentioned; so it was in regard to any other breed of cattle. They were all fighting about breeds, and would soon be as bad as the poultry-men. They all wanted their own breed of dairy-cattle; but unless they gave abundance of the right kind of feed they would not get good results. He found you had to breed first and feed after. Mr. Rutter's paper was a valuable one, and showed that he had gone into the question thoroughly. Many points made by him were especially valuable to dairymen. It was a great advantage to get the results as Mr. Rutter had given them, and a fine thing to get the experience of another man. They could then go and try for themselves. He thought the paper was likely to do good to the dairying industry in the district.

Mr. J. Lavis (Bowthorne) said he was not a dairyman, and did not profess to understand cattle at all, but they had had the best illustration they could have on the breeding and feeding of cattle, and he was thankful to Mr. Rutter for his paper, and to Mr. Bishop for his excellent reading of it. His own experience as a manufacturer was that oats was very poor as a feed for dairy-stock, and so was sorghum, and taking care of the cows was the principal part of the business, and picking them properly. He knew a farmer at Clarence Town who always chaffed everything he gave his cows. He had been taking that man's cream, and it was the best product in that district. He felt certain it paid that man for the trouble he took in feeding his cattle. He would like to see all the dairymen in the district going in for the industry in real scientific style. Housing or rugging cows was one of the principal things in winter, and if they intended to get good herds in the Hunter River District they would need to get good cattle as a foundation.

The Chairman said the Agricultural Association and the dairymen of the district should be thankful to Mr. Rutter for his valuable paper. In addition to his own practical experience, he had given facts that were borne out in the experience of older countries than Australia. A good deal had been said against Jersey cattle by people who knew very little of what they were talking about. Jerseys were said by one of the Government inspectors to be more susceptible to tuberculosis than any other cattle he had come across. The Jerseys were the cleanest, according to Mr. Rutter's paper, of any breed in America, and it had gone to prove that there was not a single case of tuberculosis in the island of Jersey. Moisture of climate was said to be more productive of that disease than any other cause, and if that were so the Jerseys should be affected more than they were in their own island home.

Countries with far greater experience than Australia allowed their people to use tuberculous cattle by simply cutting the diseased part away. But the Board of Health of New South Wales said that tuberculosis and consumption were identical. He had a great deal of experience in cattle—he had been butchering for twenty years—and he had seen any amount of cattle that were lumpy in the throat, and yet were as clean as possible. He did not think there was any connection between tuberculosis and consumption. The Americans had stated that in not a single instance had the disease been introduced from man to beast, or beast to man. Mr. Rutter placed great emphasis on the fact that they would require to have a good bull to get a good herd. He was quite prepared to believe that. The illustrations before them were all Carbines of their breed, and were only produced by the greatest care and skill in breeding, and bringing out in the best possible form, and he was quite prepared to believe the records quoted were true. It had all been brought about by good and careful breeding. As far as the cattle of New South Wales were concerned there was no breed so much abused as the Alderneys and Jerseys. They were introduced by his friend, Mr. H. H. Brown, who paid £200 for one cow. But, unfortunately, there were few people prepared to pay the price for them, and to take the necessary care required. They liked something fit for the show ring, paying more attention to good looks than the more important part of its milking qualities. He had some Jerseys, and was just as fond of them now as ever. If they got the proper class of Jersey—a good shapely, healthy beast—they would stand the weather as well as any cattle he knew of. Some of the most useless cattle he had seen were called Jerseys and Alderneys, which only went to show that people did not attach sufficient importance to the sire. A good constituted Alderney would hold its own with any breed of cattle they could find.

Mr. J. H. Decent (Jerry's Plains) said he could endorse everything said about Jersey cattle. He had been working a cross of Durhams and Jerseys, and tested every cow in his herd, keeping a record in his book. He tested his cows three times for milk, and any not up to the mark he threw out. So far as the Jerseys were concerned they always came out on top; but, of course, he had no pure breeds. All his cows were artificially fed, and the Jerseys came out best right through. As regarded the feeding of cattle he was a great believer in pumpkins. He had grown last season 25 acres of pumpkins, and fed 109 cows on them. They were getting fair dry feed, and all were in good condition. He found the butter-fat test to be 3·9 before feeding on pumpkins, and after a fortnight the test went up to 4·4. There was not a great difference in the quantity of the milk, but there was in the quality. He thought, therefore, that they could increase the butter-fat. He advocated the dehorning of cattle.

Mr. H. Croaker (Woodville) asked Mr. Decent how long the test continued when the increase of butter-fat was noticed.

Mr. Decent said as soon he knocked off the pumpkin feed, he put the cows into a paddock which he had spelling. There they increased the quantity of milk while the butter-fat test fell away.

Mr. Croaker said they had had it put before them very forcibly by no less an authority than the late Mr. J. L. Thompson, that the butter test could not be improved beyond the cow's natural limit by feeding. The practical experience of Mr. Decent was against that, and although he had not taken a test in the same manner, he had proved that particular feeding did improve the quality of the milk. It seemed to him unreasonable that they could not improve the quality of the milk. He used corn just coming into cob, and he fed it to his cows exactly with the same results as Mr. Decent had noticed with pumpkins.

Mr. Goldie said he could bear out some of the statements made by the late Mr. J. L. Thompson. His opinion was that both Mr. Decent's and Mr. Croaker's cows were not fed up to what they could digest before the difference was noticed, and the increase of butter-fat was due to feeding them up to their full capacity, not to the feed itself. If they fed a cow up to her full ration, it was impossible to increase her butter-fat beyond a certain point.

Mr. Arthur Prentice (solicitor) said he knew nothing of dairying, but pointed out that the natural feed of cows was grass, and the test of a cow he believed should be on her natural feed. (Mr. Goldie: No.) Therefore, cows running on grass, and bringing a certain test, and which were then brought to a higher point by different feeding that increased her test, proved, it seemed to him, that there could be an increase in the butter test over that given on the natural diet of the cow.

Mr. Decent said his cows were bursting in the paddock with clover, and had plenty of herbage and grass.

Mr. Geo. Winkley (Forest Hill) said one year on his farm he had a quantity of herbage which he had turned into ensilage, and on feeding his cows on this the test immediately went up. He found excellent results feeding from ensilage, and he put it down to the feed, because his cows were of no particular breed. The Hunter River District was very favourable for dairymen. They had found the best results to be obtained through the bull, but many had been compelled to buy cattle wherever they could get them, and that was why their cattle were not all of special breeds, the same as in other countries. They must get time in this matter, and eventually they would have a better class of cattle. He had two Jerseys in his herd, and had not been in a position to buy others. He lost fifty head one winter, and had to buy where he could, but if he had continued dairying he should have worked them out in favour of the Jerseys.

The Chairman said if the butter-fat could be improved by feeding there would be no necessity to try and improve the breeding of cattle at all.

Mr. Croaker said the experience of a neighbour of his, a practical man, was the same as Mr. Decent's—but he fed on grammas instead of pumpkins. He was satisfied he had improved the quality of his milk. He was satisfied with Mr. Goldie's explanation, but they had to test the matter.

Mr. Bishop said he had been under the impression for many years that they could not improve butter-fat by feeding—that was if they gave the cow ample food before they tried the experiment. As Mr. Goldie said, with a proper test they could not do it. Mr. Decent and Mr. Croaker said they could; but he thought in both cases these cows were on poor grass, and had not had a fair and honest ration. Many feeds did not suit the constitution of the cow. That was the reason why sorghum and some other feeds did not prove butter. Mr. Rutter, in his paper, was of opinion they could not increase the percentage of butter-fat if cows were fed up to their proper ration; but he admitted that the quantity of milk could be altered in a very few days. He believed if they took more care of their cows they would not be so subject to tuberculosis. He believed some cows were like human beings—very susceptible to colds when exposed to the weather, and these would sicken or die eventually. He believed it possible for a cow to have tuberculosis and to be cured. They did not kill human beings because they were sick, and he saw no reason for killing cows that were diseased. They should try and cure them. He had seen cows that were quite healthy looking and yet when killed they were found to be reeking with tuberculosis. He did not believe the disease could be transmitted from beast to man. A short time ago at the Hawkesbury College tuberculin had been injected into eight cows. In twelve months time these cows were tested again, and three were found to have nothing the matter with them. Then the question arose, Had these cows suffered from tuberculosis?* If so they must have been cured. He thought cows suffering from tuberculosis should be isolated.

Mr. Croaker in moving a vote of thanks to Mr. Rutter for his interesting and valuable paper, said the writer had gone into his subject in the most careful manner, and his records of the Jersey cow demonstrated that very great pains had been taken in its compilation, and that the breed was unsurpassable. He wished they had someone else to come along and give them a paper on some other classes of cows. He did not think the Jersey the only cow worthy of consideration; but Mr. Rutter was worthy of every consideration for the able manner in which he had put her case before them. That part of his paper on the influence of feed on the milk had brought about more discussion than anything they had yet before them. He felt he had more practical benefit from the questions asked and answered than most readings given them.

[The Department is indebted to the *Maitland Mercury* for the report of this discussion.]

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* If tuberculin is injected into a healthy beast, it does not by any means follow that that animal will become tuberculous. The object of the test is to ascertain whether the animal is free from the disease or not.

JERSEY CATTLE.

P. QUIRK.
Berry Stud Farm.

I HAVE read with interest the very valuable paper by Mr. Williams, printed in the May number of the Gazette, and also the reply by Mr. D. Hyam, "Durham *v.* Jerseys." I am of the opinion both gentlemen take extreme views of this very important question, and leave the middle course severely alone. Mr. Williams is right as far as many of our so-called Jerseys go; but the Jerseys being a class of cattle which have won honours for themselves in the show yards and in milk and butter tests, it is not fair to them to be called milking goats. The despised Jerseys I freely admit have done much to deteriorate the dairy herds of the colony. When I say "Jerseys," in my opinion the fault should not be laid at the Jersey's door, but should rest upon many of our show-ring judges. If the judges and breeders will bear with me I will try and explain; if not, my remarks may be endorsed by the practical dairyman. Some show-ring Judges will tell you the typical Jersey must be a small cow, fine in quality and not too gross. If she has plenty of size in her, with capacity to carry large quantities of milk with good constitution, she is generally looked upon as too coarse and drummed out of the ring, while the finer and more delicate animal is called typical and carries off the prize.

I will give my readers an example of what I mean: I lived close by one of the best Jersey herds in the colony—you will pardon me for not mentioning names—the owner was an astute man and would not give a twopenny dash for a cow that had not size, substance, and quality. He went to England and purchased some of the largest and roomiest Jerseys he could procure; of course, they had quality also—truly a dairy cow. The result was the farmers sought after them because they were almost as large as our Ayrshires and gave buckets of milk with a high test. When shown in the ring those cows were turned out of the show yard without honours and called cross-bred. The owner, being a sensible man, ignored the show-ring judges and went on in his own way; but good men don't live always. Afterwards, the herd was owned and managed by as keen a judge of Jerseys as I ever met. He took a different line, milk or butter was no object to him as his bread was not depending upon it. His ambition was to breed Jerseys to win in the show-rings. His first aim was to fine the herd down. The young stock were reared that poor and miserable they almost had to lean against the fence for support; in fact, some of them died with starvation. I one day said to the owner, "You ought not to have good stock, rearing them like this." "Oh!" he said with a laugh, "I want to suit the eye of some Johnnies that judge at the ——; they kick a cow out if she is large and will call her cross-bred." At any rate he reared a bull that gained two First and Champions in two successive years at the Royal Agricultural Show, and many country prizes fell to his lot. With one of his cows this man won First and Champion, and Second with his other cow. The latter was subsequently sold, and the next year she also gained First and Champion at the Royal. Now will any sane man contest the fact that by breeding this herd down to suit the eye of the Show-ring Judge, he did not materially ruin their constitutions, and would this not have utterly ruined them if kept on. So you see many of our Judges instead of assisting to build up the Jerseys, lend a willing hand to keep them on the light side, and tell the dairyman if he requires large cattle to go in for some other breed. The Jerseys must be small. Thus those small, weak-constitutioned Jerseys, crossed with the dairy cows, have done much to deteriorate our stock into what Mr. Williams terms "milking goats." But why can we not do like Mr. Hyam,—endeavour to get size and constitution into the Jerseys? He has given us a reliable and striking illustration of what the Jerseys can be brought to; but Mr. Hyam has only quoted his herd, which are an excellent lot, and prove themselves such. All Jerseys are not like his, however, and Mr. Williams spoke in a general way. We should endeavour to breed on like Mr. Hyam or the herd I have quoted in the first instance, and then the Jerseys will stand in the front rank as the dairy cow of the Colony if we can get size and constitution into them. This can be done by good feeding, breeding from our largest cows, and letting the young heifers have time to develop before they are mated with the bull—in other words, they should be 3 years old on the first calf, as we need have no fears of the Jerseys running into beef like other breeds.

IN DEFENCE OF JERSEYS.

M. H.

IN 1893 I started breeding Jerseys in New South Wales. The locality, Badgery's Creek, is only about 90 feet above sea-level, the winter nights are bitterly cold. I have not kept records of temperature, but frequently have had waterholes completely frozen over. The grass was not good, but there was lots of swamp oak. During the first winter I had no feed, and it proved the worst winter I had. But I wanted to see how the Jerseys would come out of the trial, and left them to take their chance. They all came through in fair condition, but common cows of my neighbour's were to be seen dead in the paddocks all around, and many were sold for pigs' feed at 10s. per head. Since then I have not fed the herd in winter time, nor rugged them, and I have not lost from death one animal. Having proved their hardiness to my satisfaction, I am now going in for soiling, on the principle that what has given satisfaction under poor circumstances will do better with attention.

As for records of milk and butter I have not had them tabulated, as all milk was fed to calves, and no butter made except for household use. But coming in contact as I do with the leading breeders of these colonies, I can, with confidence, state that Jerseys will beat any other breed for either butter or cheese, and this I hope shortly to be able to prove by figures. Mr. Wren, who manages the Kameruka Estates, has for years made statistics of his animals' products, and of Jerseys in particular, and has promised me some figures. Only recently he wrote me particulars of a heifer, not yet 2½ years old, six weeks in milk, giving 2·53 lb. of commercial butter per day. The average butter ratio of 889 cows tested in England over a period of fourteen years is 19·25. In Sweden and Denmark the average for the native breed is 28·50. In 1894 Professor W. Brown gave the results of two years' testing of five breeds of cattle on the same farm and some food, and the Jerseys came out on top. At the Chicago ninety days' test the Jerseys beat all other breeds in every respect. I could look up authorities, and give you overwhelming figures to prove the Jerseys well ahead of other breeds, but then I should possibly be wearisome. The dairy-farmer of to-day, who is not convinced of the superiority of Jerseys, is not well posted up.

I have before me a catalogue of cows offered for sale by a very widely known American firm of Jersey breeders. Records are given for every cow, and not one gives under 14 lb. of butter per week, and the champion gives 28¾ lb. There is at present a cow in America giving within a fraction of 6 lb. per day. Of course some of your readers will in their wisdom, say: "Ah, yes; another Yankee yarn." But I may say that the Americans have been the first to recognise the strength of Jerseys, and have encouraged the breed to produce better results still. Coming back to New South Wales, I may mention that Mr. Alex. Hay, of Coolangatta, told me that a certain farmer on the estate had forty-nine ordinary cows to care for. Being no doubt a good man he was given the more valuable Jerseys to look after, and the forty-nine were replaced by thirty-eight Jerseys, and even with this lesser number the man made better returns.

THE JERSEY CATTLE SOCIETY OF AUSTRALASIA.

THIS Society is well agoing now. Entry forms for the Australasian Jersey Herd Book were sent out some time ago, and already returns are to hand from nearly all breeders of repute. Such herds as those owned by the following breeders comprise the very choicest stock in the Colonies:—R. L. Tooth, of Kameruka; A. L. Manning, Bega; Dr. John Hay, Coolangatta; James McCulloch, Victoria; G. T. Chirnside, Victoria; F. A. Wright, Ryde; J. D. Cox, Mudgee; and others too numerous to mention. It is hoped to complete the first volume of the Herd Book by the end of the year. The Secretary would like to point out to breeders the advisability of entering any stock in the first volume. There is no doubt that those who do so will get into the Herd Book on the easiest terms. The English and the American Jersey Cattle Societies have, year by year, made the conditions of entries more stringent, until now the latter will not accept any animal whose pedigree cannot be traced from former entries in its books. Certainly this is good for the breed and in time may be adopted here. Then those whose stock does not appear in the first publications will lament, and their stock will not bear the brand "first-class" in the estimation of the public.

It is evidence of the Jersey Cattle Society's already asserted influence, that its founder and Hon. Secretary should have been nominated a Judge at the last Sydney Show and the next Melbourne Show, besides several country Shows.

The Jersey Cattle Society offered at the recent Sydney Show two gold medals for best male and female Jersey cattle any age. These were won respectively by Colonel F. A. Wright, of Ryde, and Mr. A. Thompson, of St. Mary's. The Royal Agricultural Society of Victoria have accepted two similar medals to be competed for under same conditions at their forthcoming Show.

Mr. Williams, of Tarro, whose paper, read before the Hunter River Agricultural Association, was reproduced in the *Agricultural Gazette* for May last, p. 356, is certainly to be congratulated upon having called forth so many valuable contributions on the subject of Jersey cattle, whose champions appear to be legion. If dairy farmers and breeders having experience of other classes of cattle will each take up and discuss the merits of their approved breed, and provoke the same amount of information as these articles contain, the result will be of the greatest benefit to the dairy industry. The Department of Agriculture will certainly do all in its power to further such a discussion, and this opportunity is taken to remind dairy farmers and agriculturists generally that the *Agricultural Gazette* is always open to any one who has information to impart or questions to ask in reference to any subject that affects the advancement of dairying or any other branch of agricultural industry. Every one who reads the foregoing articles will admit that the Jerseys have had a pretty fair deal. Who is going to take up the next breed? Just let some one start the discussion; the others will take it up readily enough once the ball is arolling.

In passing, it is perhaps worth asking whether it would not be a good plan for those whose experience leads them to believe in any particular one of the other breeds to do like the Jersey advocates have done—inaugurate a herd-book. If that be impracticable, surely there is nothing to prevent every dairy farmer in the Colony keeping a personal record of his herd. The man who milks fifty cows for the same returns as forty is staggering under a burden that is too heavy for him in a business like dairying that is pretty hard graft all along the line. Of course, is is only nonsense for any one to think that a herd is going to be worked up to perfection, or anything like it, in a year or two, or by simply chasing a cow around with a note-book and pencil. But, surely, there is something sufficiently alluring in the reward that will follow earnest efforts to find out what breed of cow is best suited for one's conditions of country; to find out then what is the most perfect type of that breed from a dairyman's point of view; and then to work steadily and systematically to achieve it. At any rate, if the *Agricultural Gazette* can do anything to disseminate a little more knowledge on a subject of so much importance to all concerned, it will be a pleasure to do so.—Ed.

Bees, and How to Manage Them.

ALBERT GALE.

The Swarming Fever and its Symptoms.

In June last I wrote on the subject "Why do Bees Swarm?" The answer, stuffed into the proverbial nutshell, resolved itself into this: "It is one out of the many methods Nature has of distributing and perpetuating her species." True, there is a vast difference between Nature's method of distributing bees into new localities and that of other animals whose offspring leave the dam singly, or, seeking a mate, strike off to find pastures new. The offspring of bees leave accompanied by their dam, if it be the first spring swarm, provisioned for the journey, and ready to construct some of the furniture necessary for making a start in house-keeping on their own account. What is the cause of this extraordinary exodus is an effect that is followed from a cause. What is that cause, and how is it brought about? These are two out of many questions that I propose to deal with here—both more or less useful to the inexperienced beekeeper. For want of such information many a valuable swarm of bees has been lost, whereas, had the signs been properly interpreted, many of them would have been saved.

It is admitted by all, both scientific and practical, beekeepers that Francois Huber, who wrote his researches on this subject more than 100 years ago, was the greatest inquirer into bee life that ever lived. He is always looked upon as the Solomon of beekeepers, yet on p. 220 he says: "Therefore, to preserve their race, it is necessary that the old queen conduct the first swarm. But what is the secret means employed by Nature to induce her departure? I am ignorant of it." On p. 240 he again says, "It has been demonstrated that the principal motive of the young females departing when hives swarm is their insuperable antipathy to each other. All the young queens are successively treated alike in hives that are to swarm. But the conduct of the bees towards an old queen destined to conduct the first swarm is very different. Always accustomed to respect fertile queens, they (the workers) do not forget what they owe to her; they allow her the most uncontrolled liberty. She is permitted to approach the royal cells, and if she even attempts to destroy them no opposition is presented by the bees. Thus her inclinations are not obstructed, and we cannot ascribe her flight, as that of the young queens, to the opposition she suffers. Therefore, I candidly confess myself ignorant of the motives of her departure. No one cause induces the old queen to depart from the hive or the bees to swarm out without her. The same is the case with young or virgin queens." I think if the justly celebrated Huber had looked for the external natural conditions, and had noted how these produced the internal circumstances necessary for what he terms "the formations of swarms," he would have discovered "the motives for her departure." The motives that cause the queen to depart with a swarm from the hive are the seasons beyond dispute. Yet there appear to be climatic conditions that are obscure to us, but are, nevertheless, instinctively understood by the bees. The whole rank and file of the hive are not ignorant of the fact that conditions are fast ripening for that all important time; that the hour is at hand when they must go forth and set up a home for themselves. When and how the word is passed from bee to bee that swarming is to take place, and that on a certain day and hour the flight is to be made, appears to largely depend on the age of the maturing queens, and the favourable condition of the weather. In fact, the productiveness of queens largely depends upon the seasons. If in early spring the blooming of honey-bearing flowers warrants a continuity of a few weeks' honey flow, the preparations for swarming are proceeded with. Just at this point is where the skill of the practical (I do not mean professional) beekeeper aids in the production of early swarming. Here I must repeat that string I have so often harped upon—the numerical strength of the hive carried through winter with a sufficiency of food to induce the queen to commence laying, when the first signs of a favourable spring for swarming arrives. If we place ourselves near the hives in early spring, and carefully watch the ingress of the inhabitants, it will soon be apparent that pollen gathering is the chief industry just now. It is one of the chief ingredients in food preparation for the raising of brood. To this end bees are often supplied with artificial pollen to aid in the early maturing of swarms. The eagerness of bees for pollen gathering is the earliest sign of the approach of the first swarm of the spring. On examining the frames of brood combs within the hive, if the queen be from 10 to 12 months old, there will be an abundance of worker brood in all stages of development, from the tiny eggs just laid to the emerging young bee. In addition to these there will be a large number of nurse bees, young downy ones, eagerly engaged in supplying the infantile wants of the younger brood. These are among the first internal indications of swarming. If the bees be a well established colony, and the queen is about completing her first year, there will be indications of the approach of drone laying. In the early part of her life a fecundated queen never lays what are termed drone eggs. When about entering the second year of her existence her drone-laying powers are first developed. The maturing of drones within the cells is the second stage in the order towards swarming. There are no drones wintered with the bees. Of course it can be done artificially, and perhaps under required conditions it is done when bees are in a state of nature.

As spring advances and bee food becomes more plentiful, the bees seem to realise the conditions necessary for swarming. As queens do not leave the hive, after their return from their marital flight, till they go forth with the first spring swarms, the swarming conditions must be arrived at by the queen observing the abundance of the food supplies brought in by the bees, and the genial warmth of spring.

In the first place these auxiliaries conduce to the rapid increase in worker brood, followed, as before stated, by drone production. Drones as their strength and power of flight increase do not remain in the hive like young workers, but are eager to get on the wing. During the warmest parts of spring days their deep hum can be heard mid-air, and if we place ourselves near the hives we shall see them busy at the entrance thereto. This will be a sure indication that queen cells are in progress and young queens are developing. When looking through the hives, these cells are easily distinguishable from the worker or drone cells both by their form and their positions. They are constructed, as a rule, on the edges of the combs. There is no rule as to the number: neither do the number of cells give any indication of the number of swarms that will be cast off during the season from any particular colony. If there are a dozen or more queen cells containing maturing queens it is seldom that two or more of these are of the same age, that is, it is not probable that any two of them will emerge from the cell at one and the same time, for reasons to be explained further on. The perfecting of these developing queens is another advancing stage in the swarming symptoms. The aversion that queen bees have the one to the other is well known, and also the jealous guard placed over the cells by the workers; yet a fertile queen, one destined to accompany the first swarm of the season from the hive, is allowed all sorts of latitude. She is permitted to approach the cells containing developing queens, and if she even attempts to destroy them, the working bees offer her no resistance. How different is the action of bees towards a laying queen to that of the virgins! Is it caused by filial affection? As soon as all the swarming indications succeed one and the other, that is, the rapid increase of workers, and of worker brood, the advent of drones, and the perfecting of young queens within the cells, if the weather be favourable, the first swarm may be expected on any day, and almost at any hour, generally from 10 to 12 a.m. I have known bees to swarm as early as 6·30 a.m., and as late as 5 p.m., but such times are exceptional. No queen, under normal conditions, will go forth with a swarm before depositing eggs in queen cells; but she will leave before the first young queen emerges from her cradle.

There is one symptom of swarming that is infallible, a peculiar sound they emit, and known by most beekeepers, termed piping. But singularly enough, piping emitted by the bees does not take place prior to the issuing forth of the first swarm, but prior to that of the second. Therefore, it is sometimes contended that the sound is only produced by virgin queens. Be that as it may, it is an unmistakable sound, differing from every other note produced in bee music. It is a high-set, rasping note, likened to "'peep, peep, peep,' and hence the word 'piping' has been applied; but 'teet' and 'zeet' have seemed to some to better mimic the *vox regalis*"* These sounds can easily be distinguished above the ordinary hum of the bees. By placing the ear to the side of the hive after the bees have ceased from outdoor labour the sound of "peep, peep, peep," will be heard at frequent intervals. Both the young queens imprisoned in the cells as well as those at liberty produce this challenging cry. Huber says, "What seemed most singular was that this female (virgin queen) emitted a very distinct sound, or clacking, from her prison. It was still more audible in the evening, and even consisted of several monotonous notes in rapid succession." Further on, referring to a newly-emerged queen, he says, "When she approached the other royal cells, the bees on guard pulled, bit her, and chased her away; they seemed to be greatly irritated against her. She twice emitted the sound; in doing so, she stood her thorax against a comb, and the wings crossed on her back; they were in motion, but without being unfolded or further opened. Whatever might have been the cause of her assuming this attidude, the bees were affected by it; all hung down their heads, and remained motionless. The queen confined in the second cell had not yet left it, and was heard to hum several times." Undoubtedly for hum he means pipe, or clack as he terms it. If the piping is heard in the evening, every preparation can be made to receive the swarm next day. There will sure to be a swarm issue forth. I have known, after hearing the piping over night, a swarm to come forth on a bright morning; afterwards, the sky becoming overcast, they again returned to the hive, and issued out on the day following. I have also heard the piping, and on the next morning have seen the swarm rise in the air, and before they alighted re-enter, and not to swarm again during that season. I suppose the cause was a fight to a finish between the rival queens.

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* Cheshire, Vol. I.

OATEN HAY.

CHEMISTS tell us that oats cut for hay contain as much nutritive value as they do when ripened, so far as the grain itself goes, still there is a loss by grain rattling out when too ripe, and a loss of the feeding value of the straw in ripening. We think every farmer who grows oats for home use will find a profit in cutting them while the grain is "in the dough," or soft enough to crush between the thumb and finger, and curing them for hay. Both horses and cattle eat them greedily, leaving no straw, and seem to keep in quite as good working condition as if fed on timothy hay and dry oats. It is a saving, also, of the labour of threshing; and there may be another saving—they may be harvested before they begin to rust, and we have seen facts that seemed to prove it.—*American Cultivator.*

The same applies to oat crops in this Colony. Hay made from a dough-stage crop is of better colour and more palatable, as well as of greater market value, than when the grain is allowed to become dead ripe.

Experiments with Three Kinds of Smuts.

C. N. GRENFELL.

REPORT of Experiments conducted at the Mount Templeton School, South Australia, with the three kinds of smuts, viz.:—

(1.) BUNT OR BALL-SMUT (*Tilletia tritici*).

(2.) BLACK-RUST OR LEAF-SMUT (*Urocystis occulta*).

(3.) LOOSE-SMUT OR FLYING-SMUT (*Ustilago segetum*).

IN the experiments with bunt, a series of nine trials were carried out, and were as follows:—

1. (*a*) Two hundred grains of Steinwedel were thoroughly bunted by rubbing bunt spores over them. These grains were then halved; one-half was sown, and the resulting crop gave 68 per cent. of bunty plants. The other half was pickled with a fairly strong (about a 2 per cent.) solution of bluestone, and then sown; in this case there was only 1·6 per cent. of bunty plants. The seed from the pickled portion did not germinate as readily as the other, nor were the plants as vigorous at first, but after stooling no difference between them could be seen.

(*b*) Again, 200 grains of Steinwedel were taken and halved. One-half was made quite damp by putting it into clean water; it was then infected with bunt and sown, and the crop from it gave 68 per cent. of bunty plants. The other half was infected dry and sown, and in the resulting crop 84 per cent. of the plants were bunty.

(*c*) One hundred grains of clean seed-wheat were next bunted thoroughly and then halved; the grains of one-half were then taken one by one with a pair of tweezers, and dipped brush-end into a strong pickle (about 3 per cent.) of bluestone, and sown. The crop from this gave 43 per cent. bunty plants. The other half was dealt with in the same way, except that the germ-end was dipped into the pickle before sowing; in this case the resulting crop produced 45 per cent. of bunty plants. This shows that it does not matter where the spores are on the grains, the resulting crop will be affected with bunt in much the same degree.

(*d*) For another experiment, 200 grains of Steinwedel wheat were taken that had been pickled in 1895 in a strong solution of bluestone after having been infected with bunt. One-half was sown, and the crop was quite free from bunt. The other half was infected again in 1898 and then sown, and the resulting crop gave 61 per cent. of bunty plants. This shows that seed which had been pickled as long as three years before can be re-infected with the bunt parasite.

(*e*) Again, 200 grains of clean seed-wheat (Scotch Wonder) were pickled for five minutes in a fairly strong solution of bluestone, and afterwards divided into halves. Uncracked bunt-balls were then taken and pickled thoroughly in a strong solution of bluestone for fifteen minutes; the bunt-balls which would not sink being pushed down repeatedly into the pickle. In the case of sound bunt-balls the pickle probably does not penetrate the covering, and the spores inside remain uninjured. The half of the clean grains which had been pickled was then infected strongly from these bunt-balls and afterwards sown; the resulting crop gave 17 per cent. of bunty plants. Cracked bunt-balls were next put into the same strong pickle: as soon as they had become saturated these balls went to the bottom of the pickle, and after remaining there for fifteen minutes were taken out. The spores from these balls gave a soft black slime with a foul smell. The second half of the above sample of wheat was then taken, and the pickled cracked bunt-balls broken into it: after being infected in this manner it was sown; the resulting crop was found to be entirely free from bunt. This seems to show that the contained spores of perfect (unbroken) bunt-balls are not affected by the pickling of the balls, and are able to infect grain if the balls are afterwards broken. It also seems to show that, in the case of the bunt-balls which were cracked, the pickle entered them and killed all the spores they contained, so that no infection could occur from them.

(*f*) In another trial a drill was opened and bunt spores were dropped freely along the line of the drill; 100 grains of clean White Tuscan wheat were then sown in the drill and covered up; the crop which grew contained 27 per cent. bunty plants. This appears to show that seed-wheat can be infected after being sown if the grain comes into contact with spores in the ground

(*g*) Again, seed wheat was procured from a farmer after it had been pickled. This grain had been a bunty sample. Some of the perfect bunt-balls were broken into a part of the seed (100 grains) and then sown; the crop produced 17 per cent. of bunty plants.

(*h*) A clean sample of Cape oat (50 grains) was next well covered with bunt-spores taken from wheat plants and sown. The resulting crop was quite free from bunt. This experiment seems to show that the bunt of wheat is incapable of infecting oats.

(*i*) For the last experiment in bunt, a clean sample of Purple Straw was used. Of this, 200 grains were thoroughly infected with the spores of bunt. One-half was pickled with a very strong solution of bluestone (probably 4½ per cent.), and sown, but only two plants germinated and one of them was diseased with loose smut. The other half was sown without being pickled and the resulting crop gave 51 per cent. of bunty plants as well as 6·1 per cent. of plants affected with loose smut. One hundred untreated grains from the same sample were sown and gave a crop quite free from these pests.

Table 1.

Tabulated Statements of results of experiments with Bunt (*Tilletia tritici*), showing—Treatment of Seed, Germination Power, and Percentage of Bunt.

1	Number of grains sown.	Variety of Wheat.	Treatment of Seed.	Date of Sowing.	Date of germination.	Germinating Power.	Percentage of Bunt.	Remarks.
				1898.				
a	100	Steinwedel ..	(1) Grains blackened with bunt spores; sown dry.	9 July..	24 July..	80	67·7	18·3 heads were half bunty. 24·7 plants were half bunty.
	100	„ ..	(2) Grains bunted with (1); pickled in a 2% bluestone solution.	9 „	24-28 „	60	1·6	
b	100	„ ..	(1) Grains thoroughly damped; bunt rubbed on.	9 „	24 „	88	68·4	
	100	„ .	(2) Grains bunted dry	9 „	24 „	90	84	
c	50	„ ..	(1) Grains bunted; brush ends of grains dipped in bluestone solution.	9 „	24 „	80	43·7	78% grew after 26 July.
	50	„ ..	(2) Grains bunted; germ end of grains dipped in bluestone solution.	9 „	24 „	100	45	90% grew after 26 July.
d	100	„ ..	(1) Grains bunted and pickled in a bluestone solution in the year 1895.	7 June.	27 June.	80	....	
	100	„ ..	(2) Grains bunted and pickled in the same bluestone solution in the year 1895; then bunted again in the year 1898.	11 „	27 „	65	61	
e	100	Scotch Wonder	(1) Clean seed pickled 5 minutes in 2% solution of bluestone; then bunted from floating bunt balls; pickled 15 minutes in strong bluestone solution.	11 „	21 „	88	16·9	
	100	„ ..	(2) Clean seed pickled 5 minutes as above; then bunted from sunken cracked bunt balls; pickled 15 minutes in strong bluestone solution.	11 „	21 „	100	....	
f..	100	White Tuscan..	Bunt dropped in drill; then clean grains sown and covered up.	11 „	21 „	100	27	
g..	100	Purple Straw ..	Farmers' pickled seed-wheat, bunted with pickled bunt balls from same bulk.	28 May..	9 „	70	17·1	
h..	50	Cape Oat	Grains bunted with wheat bunt for several days.	11 June.	27 „	100	...	
i	100	Purple Straw ..	(1) Grains thoroughly infected with bunt spore; then pickled with a very strong solution (about 4½ %) of bluestone.	4 „	14 „	2	....	1 plant was loose smut.
	100	„ ..	Grains thoroughly infected with bunt-spores; bunted with (1), above line.	4 „	14 „	77	51	6·1% of the plants were loose smut.
	100	„ ..	Grains untreated in any way	4 „	14 „			

Note on Table 1.—The soil at time of sowing the seeds in the experiments was moist enough to start germination.
Rain—April, 1·30; May, 1·72; June, 3·06.

Phenomena in connection with Experiments.

Steinwedel ..	Grains from flowers into which black-rust spore had been inserted .	Gave 86·3% of loose smut; no black-rust.
„ ..	Loose smut rubbed freely on seed and then sown	Gave 1 plant of black-rust; no loose smut.
„	Grains produced from flowers, into which loose smut spores were inserted	Gave 6·1% of black rust; 77% loose smut.
	Grains pickled before sowing	Gave 80·9% bunt; 1 plant black-rust.
White Tuscan..	Grains from flowers into which black rust spore had been inserted ..	Many heads bearded; some heads bald; some heads white colour; some heads amber colour; 1 plant with sound grains.
Purple Straw ..	Grains infested with bunt-spore; then pickled in a 4½% solution of bluestone	Gave 1 plant of loose smut; 98% did not germinate.

Many heads were only partly affected with bunt; many plants were only partly affected with black-rust; a few grains were half sound and half bunt.

Table 2.

TABULATED Statement of Experiments with Black-rust.

Showing
- Treatment of plant, grain, or ground.
- Date when disease made its appearance.
- Percentage of black-rust.
- Tillering power of diseased plant compared with healthy plants.

2	Variety of Wheat.	Treatment of Parent Plant, Grain, or Ground at time of sowing the Seed.	Date when sown.	Germinated.	Date when disease made its appearance.	Per cent. black-rust.	Tillering power of diseased plants.	Tillering power of healthy plants.	Remarks.
A	Steinwedel ..	Seed grains produced by flowers into which black-rust spores had been inserted.	1898. 27 May..	1898. 7 June.	4 Oct..	..	1·9	3·3	
B	,, ..	Seed grains produced by flowers into which black-rust spores had been inserted.	27 ,,	7 ,,	14 Sept.	20·8	6·2	2·9	12·5 per cent. of plants were partly affected with black-rust.
C	White Tuscan..	Seed grains produced by flowers into which black-rust spores had been placed at time of flowering.	27 ,,	7 ,,	17 ,,	1 plant	..	..	Some heads bearded, some bald.
D	Steinwedel ..	(1) Seed grains from flowers into which black-rust spores had been inserted;—eye aided with a small microscope.	27 ,,	7 ,,	....	43·7	2·1	1·2	6 per cent. of plants were partly affected with black-rust.
E	,, .	Same seed as (1), above, but pickled in a solution of bluestone.	27 ,,	7 ,,	14 Sept.	..	..	1·2	
F	,, ..	Seeds from heads on which black-rust spores had been freely rubbed when the heads were in flower.	27 ,,	7 ,,	....	..	..	..	
G	,, ..	Seeds from heads on which black-rust spores were poured when it was in flower.	27 ,,	7 ,,	....	..	..	..	
H	,, ..	Seeds produced by flowers into which black-rust spores had been placed.	27 ,,	7 ,,	13 Sept.	20·8	4·8	2·6	20 per cent. of plants were partly affected with black-rust.
	Purple Straw (100 grains).	Black-rust spores and affected straw dropped freely into drill; then seed sown and covered up.	11 June.	21 ,,	....	..	..	..	

Table 3.

TABULATED Statement of Experiments with Loose Smut.

3	Variety of Wheat.	Treatment of Parent Plant, Grain, or Ground at time of sowing the Seed.	Date when sown.	Germinated.	Date when disease made its appearance.	Per cent. black-rust.	Tillering power of diseased plants.	Tillering power of healthy plants.	Remarks.
1	Stoinwedel ..	Seed grains produced by flowers into which loose-smut spores had been inserted.	1898. 27 May..	1898. 7 June.	4 Oct..	97·6	..	..	
2	,, ..	Same seed as "1," but pickled in a solution of bluestone.	27 ,,	7 ,,	4 ,,	77·	2½	3	One plant of this drill was affected with black-rust.
3	,, ..	Loose smut rubbed freely on seed before sown.	27 ,,	7 ,,	....	...	..	..	
4	,, ..	Loose-smut rubbed freely over parent head; seeds sown.	27 ,,	7 ,,	....	..	..	..	
5	Red Straw (200 grains).	Drill opened and loose-smut dropped freely into it; seeds sown and covered.	7 June.	17 ,,	....	..	..	..	

2. In working out the experiments with black-rust and loose-smut a start was made by inserting spores of the former parasites into the florets of heads of wheat when they were in bloom. The same was afterwards done with spores of loose-smut. There was, of course, no grain at the time of insertion and only the ovary which was to develop into the grain. The spores were merely placed on the stigma at the time when the head was in flower. In due time, after the heads had ripened, the grains were shelled out; some of them then showed signs of black-rust spores, but probably it was not these visible spores which caused the infection of the future plants. (*a*) These grains were sown at the usual time (27th May) and (*b*) germinated in the usual manner on 7th June. The resulting plants grew like the ordinary plants about them. No (*d*) difference whatever could be detected between these and the (*h*) ordinary neighbouring plants until 14th September, when black-rust began to develop rapidly in lines in the flags, and the plants began to show unmistakable signs of failure. (*f*) At the time when the spores of black-rust were inserted into the flowering heads I rubbed the spores of black-rust over other flowering heads. The seeds from these heads were planted at the same time as the foregoing, and the plants which grew from them received the same tillage and treatment, but the resulting plants showed no signs of black-rust.

(*g*) Again, at the time when the experiments were made, I selected a few heads which were in flower, and during a calm poured black-rust spores over them. The grains from these heads were sown in due time, but the plants from them were quite free from black-rust.

(*h*) Some grains were next taken from flowers into which black-rust spores had been inserted and pickled in a solution of bluestone; they were then sown and the crop was free from black-rust. In this case the pickling seems to have had a beneficial effect on the resulting crop.

(*i*) See Table 2.

3. (1.) The grains from the flowers, which had been infected with spores of loose-smut, were sown at the same time and received the same attention as those of the black-rust experiments. They germinated at the same time and in the same manner as uninfected seed, and no difference was discernible in the plants until 4th October when the heads burst forth one mass of black spores. The straw, also, of these plants had a much darker colour at the time of ripening than that of healthy plants, and in some cases spores could be seen throughout it.

(2.) A few of the above grains were pickled in a solution of bluestone before sowing. The crop in this case was a little better than it was when it had not been pickled; but loose-smut was still so abundant at to cause the crop to be a failure.

(3.) A sample of clean seed (Steinwedel) was blackened with spores of loose-smut and then sown; the treatment of this seed was in every particular the same as that which was treated with bunt spores, but the resulting crop was quite free from loose-smut.

(4.) I rubbed the spores of loose-smut over flowering heads of wheat in the same manner as I did with black-rust. The seeds from these heads sown at the same time as the foregoing, but the resulting crop was free from loose-smut.

(5.) A drill was next opened and loose-smut spores dropped into it in such numbers as to make the soil to be quite black. Clean seed was then sown in the drill and covered; the resulting crop showed no infection by the loose-smut.

Facts in connection with these experiments appear to point to the conclusion that, in the case of loose-smut, the spores which cause the infection of the plants, do not remain—as is the case with the spores of bunt, and apparently of black-rust also—on the outside of the seed, but that either some of them pass into the ovary with the tubes from the pollen grains, or that the infecting fungus enters the ovary in some other manner and there remains until the seed develops around it. In the case of loose smut, infection with the parasite takes place at an earlier stage of the plant's growth—viz., when it is in the seed—than is the case with bunt, which enters the plant as it emerges from the seed.

The following facts were also observed in the foregoing experiments, viz.:—(1) That black-rust increases, and (2) that loose-smut decreases, the stooling power of wheat plants.

Some remarkable phenomena in connection with these experiments were observed, which appear to show that the insertion of black-rust spores into the flowering head caused the variety of wheat to change.

In one case black-rust spores were inserted into a flowering head of White Tuscan (a bald variety), and the resulting grains produced plants of wheat, 90 per cent. of which had bearded heads; also, while 80·9 per cent. of these plants were bunty, only a single plant was affected with black rust. There was also a varied display of heads, some having white chaff and others amber; again, some heads were compact and others very open. Some of the heads had good grain in them.

In another case, when spores of black-rust had been inserted the resulting plants where nearly all affected with loose-smut.

As it is known that the spores of these fungi are carried about by the wind at the time when wheat is in flower, it is probable that the infection takes place at this time through the agency of the wind.

A Visit to an Ostrich Farm at Matarieh, near Cairo, Egypt.*

E. GRÉA.

Most of the travellers who visit Cairo devote half a day to visiting the establishment for the breeding of ostriches at Matarieh.

Having followed the general example, I was so much interested that I determined to go again to obtain accurate particulars on the breeding and rearing of ostriches.

I obtained full information from M. Bernard, the obliging director of the institution, and have much pleasure in hereby acknowledging his kindness.

Thinking that his instructions might interest some of my colleagues of the Society of Acclimatisation, I will present them as clearly as possible, as follows:—

Matarieh is a small place situated about 12 kilometres (7 miles) north-east of Cairo, not far from ancient Heliopolis, on the line which separates the Arabian Desert from the country of the Delta. On the left lies rich, well-cultivated, irrigated land; on the right is the desert.

It is on this latter that the farm is situated, about 400 yards from the station at Matarieh. The farm forms a perfect square, 275 yards on each side, but a portion of this space is occupied by the house, stores, garden, fowl-runs, passages (shaded walks), and, finally, the enclosing wall and pens, so that the whole space occupied in the rearing of the birds does not amount to more than 5 hectares (1 hectare equals 2 acres 1 rood 35 perches). It is in this comparatively small space that M. Bernard has succeeded in breeding, rearing, and managing, generally, the almost incredible number of 1,500 ostriches.

The enclosing walls are constructed of bricks made of mud from the Nile, and dried in the sun. These are mixed (which is to be regretted) with a great number of the round pebbles so numerous in the soil of the desert, as well as with chopped straw.

When the establishment was first started the eggs were hatched artificially, but the young birds were ricketty, did not know how to eat, and died off in great numbers within a few days or a month, in spite of the utmost care. It appeared quite evident that the bone system of the ostriches had not properly developed.

When M. Bernard undertook the management of the farm, eight years ago, he dispensed with artificial incubators, and left the rearing of the young birds to the ostriches themselves, of which duty they acquitted themselves admirably.

This is the way in which matters are arranged: In the yards, as many as eighteen or twenty birds, male and female, are mixed promiscuously.

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* From *Bulletin Agricole de l'Algérie et de la Tunisie.*

When the male desires to mate, which is readily discerned by the redness of the skin of the neck, by a certain manner of fluttering his wings, and by the special attentions he bestows on some particular female, whose condition, without doubt, corresponds to his own, the two birds are separated from the rest, and placed in a yard or enclosure by themselves, the walls being of sufficient height to prevent them seeing the birds in the neighbouring yards. They require no further attention. The female lays wherever she likes, the eggs often being far away from each other; never in any case do they touch.

When she has finished laying, the birds understand quite well how to gather the eggs together, always leaving aside those which are infertile.

When the young ones appear, the parents undertake their education; teach them to eat, keep them warm during the night, and, in short, rear them.

In this way, last year, M. Bernard added from five to six hundred birds to his flock.

The food for the young ostriches consists principally of chopped leek, chopped onions, and, lastly, chopped *barsim*. M. Bernard considers the leeks as absolutely indispensable to the young ostriches. Barsim is a plant very much like lucerne, if, indeed, it is not lucerne itself, of which I am by no means sure. (NOTE.—*Barsim is the Trifolium Alexandrinum.*) The soil of the pen or yard supplies plenty of sea-shells and lime. Later on, a paste (or porridge) of bran is added, and where the young birds are strong enough, broad beans. These latter, with the barsim, which is cultivated all over Egypt, serves as the basis of the nourishment given to the adult ostriches.

All the work attendant consists in giving them their food, supplying them with fresh water, removing the excrements at least every three days, digging up the soil of the enclosure once a year, removing all the dirty surface, and replacing it with an equal quantity of sand from the desert. With this care and attention, M. Bernard assured me that he had never had any epidemic disease in his pens, and only a very small number of deaths, these caused principally by the ostriches swallowing the round pebbles which they find in the bricks of the walls. They even try to pull out and eat the straws. Being unable to digest the stones, they eventually die.

On the contrary, they never swallow the pebbles found in the soil.

M. Bernard showed me a box full of pebbles found during an autopsy in the stomachs of dead ostriches.

I conclude my remarks by repeating that the rearing of ostriches is not a very difficult matter, and does not require a great space. But in my opinion, certain particular conditions are necessary:—

1. Soil of the desert: that is, containing sand, seashells, and lime, required for the development of bone.
2. Water.
3. Must be near to cultivated land, where a daily supply of fresh food for the birds can be procured: leeks, onions, barsim, all to be chopped, and also broad beans and bran.

A question is: Will ostrich-breeding be remunerative if farms are established in Tunis or Algiers under these conditions?

I incline to the affirmative, without, however, daring to guarantee it. This is what M. Bernard says on the subject:—

Each adult bird, that is to say five years old at least, is worth £10.

The feed costs twopence a day, or say 72 francs per annum.

The revenue from the feathers amounts to £4 10s. on an average.

We must also take into consideration the value of the young ostriches hatched every year—deducting all general expenses, the primary cost of the establishment, of labour, of maintenance, &c.

The establishment at Matarieh is in full production, that is, they receive a revenue from the sale of feathers, the breeding of young and sale of old birds, of which they have far too large a number, unless the place is considerably enlarged and new paddocks constructed.

The gathering of feathers commences at the third year, but the bird is not full-grown until it is five years old; it lives from forty-five to fifty years.

By the 25th January, 1898, two broods had been very successfully hatched at Matarieh. Of the young birds I saw, the first were a month old, the others eight days. They were all very fine ones.

MAIZE AND COW-PEAS.

To produce good all-round silage there is no combination more valuable than maize and cow-peas. Under ordinary circumstances a separate area is sown with each plant, and as the crops will both become fit for cutting about the same time, loads of cow-pea vines and maize stalks can be alternately brought to the silo.

An American farmer has been trying some experiments to determine whether the two crops might not be grown together.

His plan is to plant the maize towards the end of spring without fertilisers. The variety chosen is of a large-growing type, and it is put in rows 4½ ft. wide with the seeds 9 in. to 16 in. apart in the drill. When the maize is about 6 in. high the cow-peas are planted between the maize and in the same row. The work is done with a hand-planter. The object in planting the peas at this stage is to enable the maize to get a good start, otherwise the climbing variety of cow-pea growing faster than the maize, would soon smother it. Mr. Gettys uses the Whip-poor-Will cow-pea (one that grows well in this Colony, and is a runner). The vines climb up the maize stalks, and by the time the maize has begun to glaze and the pea pods to ripen there is a series of vine-clad maize stalks which can be readily cut by a maize harvester drawn by four mules. The crop is chaffed quite easily in the ordinary way, the knives of the cutter being set for ½ in. in length so that the whole of the material goes into the silo well mixed.

On the Measuring of Cattle.[1]

It has often been a question whether or not to use mensuration to estimate the more or less perfect build of beasts.

Professor Sanson, a long time ago, lectured on this subject, and other zootechnicans have also made a study of the same.

The idea was natural that one could advantageously supplement and correct the errors that a first inspection would be liable to; that the experience which long practice gives to the breeder would be comparatively useless, and that the first comer, armed with compass and yard measure, could at once make a selection. It has even gone further than this, and the question been discussed whether the measuring could not, at exhibitions, replace the jury, whose competence and decisions are so often disputed, and with just cause. By using a mathematical arrangement, the judging would become a simple operation of measurement. Though a very inviting theory, this system has not come into general practice, and I have been trying to find out the reason.

Very interesting communications from M. Cagny have recently drawn attention to him. He informs us that, in the Duchy of Baden, Dr. Lydtin has reduced the method to eight principal measures, of which we will speak later on, and has organised in the different communes public meetings where the animals are measured in the presence of the breeders, and those which do not reach the necessary minima and maxima are at once condemned as unsuitable for breeding.

This system has given very good results, and the race of cattle in this country has improved wonderfully, although it is not possible for me to say in what this improvement consists, or if it is an exclusive result of Dr. Lydtin's method. But there is no doubt that such public demonstrations will instil many useful notions into the minds of the people interested. Theoretical expositions will never be as clear and persuasive.

In Switzerland also the system of mensuration has been adopted, but there they appear to have carried it to excess and exaggerated the details. We find a scale of 22 points of measurement on the animal, and we meet here a great difficulty, which is the relative importance to be attributed to such and such a part. To arrive at a classification we must make use of certain co-efficients, which are strongly arbitrary.

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[1] From *Journal de l'Agriculture.*

All breeders are astonished, for instance, to see the dimension of the head counting for 10 points, whilst the depth of the chest only counts for 3, and the width of the side 5 points. And, of course, there are certain qualities of great importance which absolutely cannot be tabulated by measures. Such as, for instance, the suppleness of the hide, the quality of the hair which covers it, the thickness of the muscles, the fineness of the bone substance, and, above all, indications of the milking qualities; and no breeder will doubt the importance of these points.

I may add that in judging of the exterior shape I have never found measurements sufficiently numerous to give absolutely certain conclusions. In comparing two animals of the same age and race the measures given as most important have not always been to my liking.

Whatever may be the inconveniences of judgment by jury (and nobody denies them), I for one do not believe that measuring will replace them. The true function of measurement seems to me to be an excellent means of giving popular instruction, and it can, and ought to be, under those circumstances, of real service.

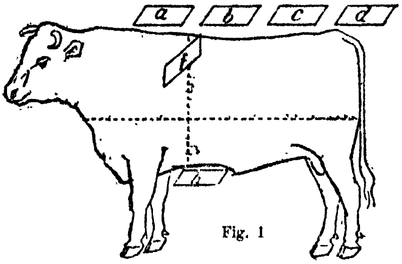


Fig. 1

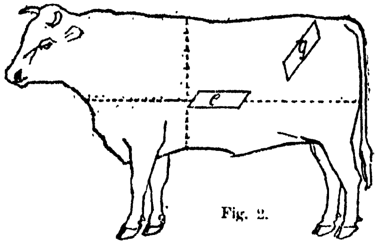


Fig. 2.

In one word, I do not admit that measurements will indicate the better of two choice animals, but I believe they will be very useful to prevent the reproduction of faulty and absolutely bad ones.

This is what I believe Dr. Lydtin has in view, and we will now examine the details of his system, as follows:—

To make certain that the line of the back approaches the horizontal (fig. 1), take the height of the body at the withers (A), then in the middle of the back (B), at the beginning of the pelvis (C), and the root of the tail (D). Afterwards, in using the two horizontal rods, measure length of body (E). Then from the point of the shoulder to the back of the buttock, the width of the side at back of the shoulder (F), and finally, the width of the pelvis at the height of the thigh-bone (G), and the height of the chest (H) just behind the neck. These measures are sufficient for most animals. Several hundred measurements taken from animals considered very good by the best judges of the country have established the following proportions:—

Requisite dimensions—

A =
B at least equal to A — 0·02 per cent.
C less than A + 0·04 per cent.
D „ A + 0·10 „

E at least equal to A + $\frac{1}{10}$ of A.
F „ $\frac{1}{3}$ of A.
G „ $\frac{1}{3}$ „
H „ $\frac{1}{2}$ „

The measure A, the height of the withers, is the one to which all the others must be in proportion, and this point of starting seems to me to be well chosen.

The other measurements are not always compared according to the same rule, and are divided into two series. The most logical principle is evidently to establish between the measure A and the others a relative proportion.

We cannot apply to both small and large animals the same diameter of chest or the same length of body measured in inches. The measurements E, F, G, H, will, however, apply in that way, because they are a multiple or a fraction of the measure A. I may add that this measure is the most important to the breeder, as is gives the relative dimensions of body and trunk, which should be neither too long nor too wide.

It is different with the measures B, C, and D, which determine the rigidity of the dorsal line. These measures are given in inches added to or deducted from the measure A.

These measures cannot, of course, be correct for a small as well as a large animal, as the difference of shape depends both on race and age. This is a defect of the method, but I do not wish to exaggerate its importance, particularly as any want of rectitude in the dorsal line is clearly visible to the eye. It is certainly a grave defect, but does not seem to have the same importance as the want of development of the body. With these reservations, I believe that the Lydtin method can render real good service, but I do not think that it is sufficient to guidè the breeder in the choice of reproductive animals. We must always take into account those qualities which this system does not reveal. It will always be useful for the elimination of very defective animals.—*E. Gréa*, Member of the National Society of Agriculture.

PROCLAMATION PROHIBITING THE IMPORTATION OF DISEASED POTATOES.

It was recently brought under the notice of the Department that some potatoes imported from Tasmania were infected with a disease technically known as *Oospora scabies*, commonly known as "potato scab." In order to protect local growers, the Honorable the Minister for Mines and Agriculture has taken action under the Vegetation Diseases Act, and has published a proclamation prohibiting the introduction into the Colony of any potatoes affected with the disease mentioned.

Cost of Fumigating an Orchard of 275 Trees.

W. J. ALLEN.

As most of our fruit-growers are, as yet, unacquainted with the facts and figures in regard to fumigation of fruit trees, and many might be deterred from giving this capital method of dealing with fruit pests a show by the discouraging remarks which at times find their way into certain of our local papers, I beg to give hereunder the actual cost incurred in the treatment of 275 trees at one of the Government orchards, and might say that, in the case of each tree, the quantity of cyanide and sulphuric acid was accurately registered. It is matter for regret that persons, having no practical knowledge of fumigation, should rush into print with vague assertions as to the cost to the grower, &c., &c., and thus deter many who might be inclined to give this certain remedy for the destruction of scales a trial; we know that many have been fairly successful with spraying, but when they find that to keep down these pests application must follow application they would willingly undertake any sure means of dealing with the scales, even were the cost of so doing somewhat in excess of the cost of spraying. My object is to ascertain by actual tests the different methods of treating and keeping under the scale pests, and if fumigation costs on an average, say, twopence per tree more than spraying it is a question of some moment to the large grower, but if by the expenditure of this twopence extra per tree the grower finds that his fruit is cleaner than on sprayed trees he will be justified in incurring the extra expense, as there is no disputing the fact that a case of clean fruit is of more value than a case of even partially clean fruit and, likewise, a clean tree is of more value to its owner than a dirty one; therefore in making up the cost of fumigating as against the cost of spraying our orchards we must take into consideration the returns in each case. For instance I have seen numbers of trees carrying from three to six cases of oranges which for size and quality were excellent, but whose appearance was marred by being simply covered with scales, and owing to this fact the fruit was not worth as much, by at least a shilling per case, as it would have been if clean. Some of these trees I know had received one or two sprayings with well tried solutions, and still the fruit was dirty.

The majority of trees in our orange-growing districts are what in many orange-growing countries would be called dwarf trees, therefore only medium to small size tents are required to cover them, and it will, therefore, be seen that the cost of handling the tents is not very great as they do not require to be swung with tackling as do the larger ones, and in consequence, fumigating citrus trees in this country will never cost as much as in California or Florida, where trees grow to a very large size.

In a series of experiments carried out at Galston a year ago by the Department of Agriculture, various sprays were tried and the results were published. At the Hawkesbury Agricultural College Orchard several sprays were again tried side by side with fumigation. As at Galston, the blue-oil and resin wash gave the best results; the fumigation, however, did the best work of all, and we, therefore, decided to use the latter means of combating the scale in this orchard—later on I will publish a report as to the results. Occasionally I find a live scale or two where the leaves or fruit have pressed hard against the tent, but wherever the leaves are hanging clear it is very seldom that a live scale can be found if the tree has received a sufficiently strong charge of cyanide. If, on the contrary, the charge has not been strong enough it does little or no damage, and the scales continue to breed and spread as though the tree had not been treated.

As I mentioned before, 275 trees were treated, and the average cost per tree was 4½d., made up as follows:—

15 trees which took less than 1 oz. each of cyanide and sulphuric acid.
34 ,, ,, more than 1 oz. ,, ,, ,, and less than 2 oz.
80 ,, ,, ,, 2 oz. ,, ,, ,, ,, 3 oz.
120 ,, ,, ,, 3 oz. ,, ,, ,, ,, 4 oz.
25 ,, ,, ,, 4 oz. ,, ,, ,, ,, 5 oz.
1 ,, ,, ,, 5 oz.

In all it took 715¼ oz. of cyanide at 1d. per ounce, and a like quantity of sulphuric acid at 2d. per pound; making for the former £2 19s. 6d., and for the latter 7s. 6d., or £3 7s. for the chemicals. The work was done at odd times, but occupied, when computed, two whole days for three men, which at 6s. per day makes £1 16s., or a sum of £5 3s., as the total cost of labour and chemicals for fumigating 275 trees.

Owing to the fact that we had only eight tents, the labour cost more than it would have done, had we had a sufficient number of tents to have kept the men going all the time. A record of chemicals used per tree was kept, and the full quantities of cyanide and sulphuric acid used have been charged for at highest market rates, so that 4½d. per tree covers all the cost incurred, and can be taken as the outside cost of fumigating an orchard of this size.

The one treatment will I consider keep the trees free from scales of all kinds for one year, together with all fruits grown on them.

There are very few growers nowadays who are not acquainted with the cost of spraying; some with good, while many have had very indifferent results. Whether it is because they have not mixed their sprays properly, or because they have become disheartened, and condemn spraying when they have found that one application did not clean their trees—I cannot say. Others claim that they have given the best sprays a fair trial, and still the trees are dirty and the fruit also. To all growers, therefore, I can with confidence recommend fumigating, and from my own experiments can affirm that it has kept the trees free from scales during the whole season, and, in consequence, the fruit was fit to send on to any market without fear of its being condemned and the owner losing thereby.

I have given these details in order that those interested may have an idea of the actual cost of the work, and will thus be in a position to judge for themselves which course to follow (spraying or fumigating) for the destruction of all scales on citrus and other trees.

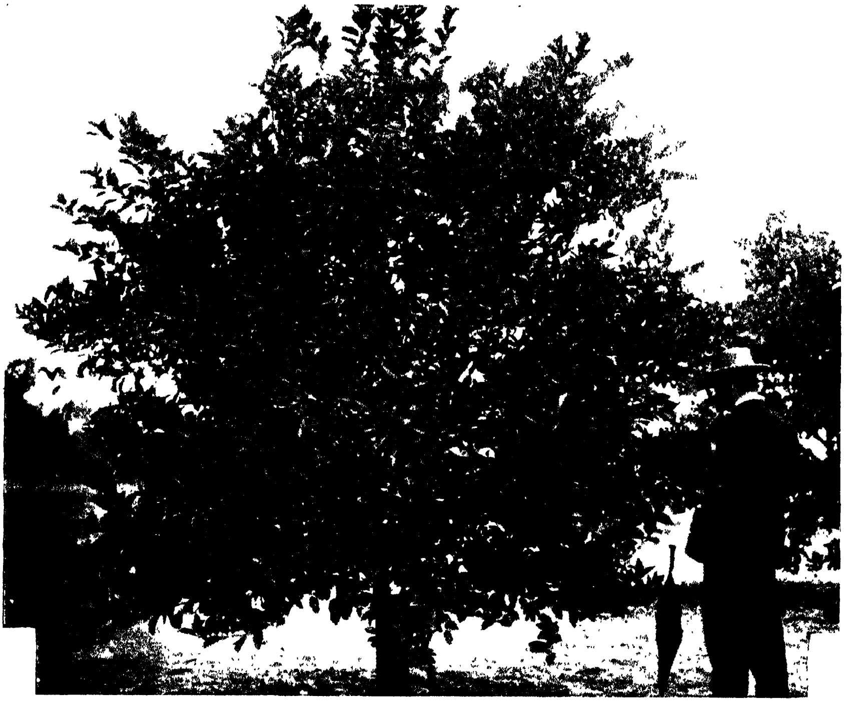
I may say that the largest tent used on the largest tree was 16 feet high and 34 feet circumference.

The two trees shown are a large lemon and an orange tree, both of which were included in the experiments, and will give a fair idea of the large trees.

RAISING SEEDLING POTATOES.

To produce a strong and vigorous potato, with good eating and keeping qualities, we must select for its parents varieties possessing these qualities; and by judicious crossing we may expect, to some extent, to fix in the new variety some at least of the qualities we desire to produce. The seed balls should be gathered early in the season, laid in the sun a few days, and then squeezed out into water. The seeds will soon rise to the top, when they have to be skimmed off and placed on paper or cloth to dry. After drying thoroughly in the sun, or a warm, dry room for about forty-eight hours, the seeds are to be put in paper bags to keep until wanted.

Early in the spring they may be sown thinly in rows in a hot-bed, or later in the open ground. When two or three weeks old the seedlings have to be pricked out singly into carefully prepared hills, which should be about 2 feet apart, in rows 3 feet apart. A small numbered stake has to be put in each hill, and during the growing season detailed notes should be taken concerning the habit, strength, time of ripening, yield, and general appearance of each plant. This record must be continued each year for five years before one can definitely ascertain the real value of a variety, as many of those which appear promising at first run out entirely, and sometimes those which we were tempted to discard the first few years may prove our very best varieties. At digging time, select only a few of the largest and best-formed tubers of each kind, placing them into carefully marked boxes, each kind by itself, and in planting use only the largest specimens for seed. At the end of the fifth year, if good culture has been given, probably one or more varieties out of a hundred seedlings will be found that will pay for all the labour and care given them. Yet it should be borne in mind that little or nothing is gained in securing a new variety unless it is in some points better than in any of the old kinds.—*New Zealand Farmer.*



ORANGE TREE. TREATED.

The Excessive Earliness of many of our Wheat Crops.

R. W. PEACOCK.

THE very favourable climatic conditions which have obtained since the beginning of the year over most of the wheat-growing portions of the Colony, have been the cause of a great number of the early-sown wheat crops becoming too rank and heavy, and in a number of instances running into ear before the winter frosts had properly set in.

This means a serious loss to many wheat-growers who have not taken the precaution of feeding off with sheep; in some cases the excessive rains made the land too boggy to allow of this. The very favourable conditions experienced during March, enabled farmers to sow early and germination was ensured; this in conjunction with the mildness of the early winter, caused an almost phenomenal growth, so much so, as to ruin many of them for grain crops, the frosts having already bitten the leading ears and checked many which have to take their chances of any late frosts during early spring.

The severe losses experienced by many farmers owing to the early crops of last spring being frost bitten, prevented a number from sowing so early this year.

The system of getting crops in early is a good one, and in nine cases out of ten is attended with the best results, but some discretion should be used as to which varieties to sow early in the season and which to sow later. Perhaps my experience and experiments in this matter may prove interesting to many farmers who have not the opportunities of investigating for themselves. The land chosen, the time of sowing, and cultivation, were such, in the following experiments, as to allow of faithful comparisons. During the last week in March, 4-acre plots of the following wheats were sown. Hudson's Purple Straw, Steer's Purple Straw, Farmer's Friend, Rattling Jack, Steinwedel, Allora Spring, and King's Jubilee, as well as forty other varieties in single rows twelve chains long, adjacent to each other for comparison. Fifteen weeks from the date of sowing a surprising difference was noticeable, the heights ranging from 3 inches to 3 feet, some varieties lying flat along the ground and stooling profusely whilst others were out in ear.

Of the wheats sown in 4-acre plots King's Jubilee was the most forward, fully 15 per cent. of which was frost bitten, after coming into ear early in the winter.

Allora Spring was the next earliest and was slightly injured by frost, Steinwedel only narrowly escaped, whilst the four purple straw wheats were not seriously affected. Amongst the single rows were five of Mr. Farrer's cross-breds which had been bred and selected for their earliness; these were the earliest of them all and suffered severely. Clubbed Indian, Early Para, and Early Baart, also were too forward and coming freely into ear.

It will thus be seen that owing to the favorable conditions prevailing since the end of March, that the following wheats were sown too early; the earliest being placed foremost.

Five of Mr. Farrer's cross-breds.
King's Jubilee.
Early Para.
Early Baart.
Clubbed Indian.
Canning Downs.
Medeah.
Allora Spring.

The two following narrowly escaping:—

Steinwedel.
"Sullivan's Early Prolific" (synonymous with Steinwedel).

The following were not seriously affected but were rather benefited than otherwise by being sown so early,

Hudson's Purple Straw,
Steer's Purple Straw,
Farmer's Friend,
Rattling Jack,
Brodie's Prolific,
Red Straw,
Dart's Imperial,
Blount's Lambrigg,
Chant's Prolific,
Tall Bearded Neapolitan,
Frampton,
White Essex,
White Naples,
White Tuscan,
Golden Drop,
Berthoud,
Australian Talavera,
White Lammas,
Sapphire,
Nimitybelle,
North Carolina,

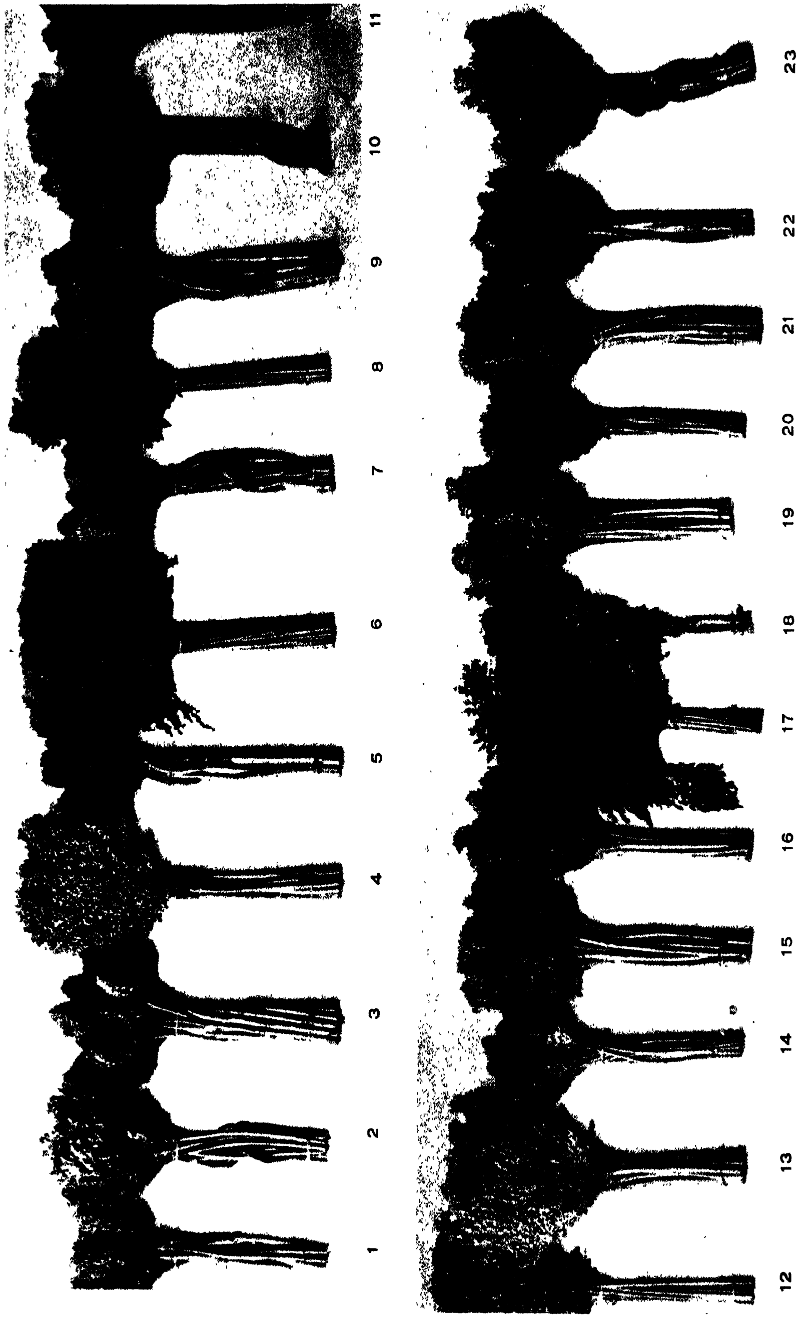
and several others from Asia Minor. Many of the last-mentioned wheats could have been sown fully a month sooner than the first without any injurious results.

It would, therefore, be wise to sow the slower-growing varieties earliest, leaving the quicker growers to the middle or end of the sowing season.

Under conditions more favorable than those obtaining here perhaps some of the last mentioned may have grown too rank and would need eating down by stock.

The rainfall from the beginning of March to the 1st July, was the following:—

1 March ...	29	23 April ...	2	16 May ...	36	5 June ...	56
6 ,, ...	25	29 ,, ...	24	17 ,, ...	45	6 ,, ...	8
7 ,, ..	40			18 ,, ...	6	15 ,, ...	7
15 ,, .	1		26	19 ,, ...	1	10 ,, ...	3
21 ,, ...	135			23 ,, ..	5	23 ,, ...	35
30 ,, ...	6					24 ,, ...	22
31 ,, ...	16				93		
							131
	252						
						Total ...	502 pts.



INDIAN MILLETS, OR SORGHUMS, GROWN AT WOLLONGBAR.

Indian Millets or Sorghums grown at Wollongbar.

H. V. JACKSON.

THE word "sorghum" is said to be from Sorghi, the Indian name for millet grass, a genus of annual or perennial grasses, inhabiting the warmer parts of the globe, and more or less extending into temperate regions. The most commonly known and grown in these colonies are Amber Sugar Cane, Sorghum Saccharatum, Planter's Friend, Kaffir Corn (*Sorghum Tartanium*) and Broom Millet; also Hungarian Millet (*Setaria Germania*) and Johnson Grass or Evergreen Millet (*Sorghum halepense*.

The Amber Cane, Sorghum Saccharatum, Planter's Friend, and Johnson Grass are grown for green feed. The Kaffir Corn, owing to its large white seed, is suitable for fowl feed, and the Hungarian Millet is grown for green feed and hay. The Johnson Grass is very prolific in growth, but is very objectionable near cultivation, as it is sometimes difficult to eradicate. In this district Amber Cane and Planter's Friend appear to be most favoured by farmers for their cattle. The Amber Cane appears to be wonderfully palatable to stock when used in making silage, together with maize or teosinte. There are numbers of other varieties, the most commonly known being Imphi.

In Hindostan, sorghum is extensively grown as a food product by the natives, who call it jowar or joudhala. The grain is the staple food of the poorer classes of India, while the stalks are called karbi or kadba, and are used as food for cattle at such times when other cattle food is scarce.

The Department of Agriculture some while ago obtained from India a collection of jowar seed, with the object of testing the varieties by way of comparison with the sorghums already cultivated by our farming community, and recently Mr. W. S. Campbell, of the Department of Agriculture, forwarded me a very interesting pamphlet issued from the Residency of Hyderabad on jowar cultivation in Berar, in which district it is stated there are no less than forty-three varieties of the jowar plant cultivated—and of these, twelve varieties are known as Wani; they are eaten when green, *i.e.*, when the grain is tender and in the ear, after being baked in hot ashes. This jowari, usually known as harda, is said to be sweet and tasty and is considered a great luxury.

Nothing would be gained by my giving a list of the names mentioned of varieties grown in Berar, as the names of the varieties received from India do not appear to be the same. It appears, however, that considerable difference is experienced in the quality of bread made from different varieties. The natives never import seed, but obtain it locally, selecting the seed for the next sowing at the time of plucking the ears, and being guided in the selection by the largeness of the ears and the colour, size, and plumpness of the grain. The seed is considered to be in the best condition for sowing six months after being stored away; and seed which is older than a year is never used. Immediately before sowing the seed is soaked in a solution of assafœtida and water, or the juice of the takali plant, or the urine of the cow and dried, as it is thought this prevents the seed being attacked by worms in the soil, and assists and ensures germination. The application of urine is the most common practice, and is regarded as the best.

The natives are, as a rule, alive to the beneficial effects of ploughing, but the operation being somewhat expensive, they do not resort to it excepting when the fields are overgrown with weeds or the soil is hard. In the case of unploughed fields, harrowing is the chief operation towards the preparation of the soil—the soil is harrowed twice before and once after the rain has fallen. The first harrowing is done with a large harrow, known by the name of wakhar, drawn by four bullocks, and the second operation by a smaller wakhar drawn by two bullocks.

The jowar plant as a rule does not need much manuring, and is cultivated in many parts without any manure at all, and in others by a small quantity being applied once in two or three years. It is believed by some that much manure is detrimental to the jowar plant, which becomes stunted in consequence, and yields less grain than otherwise. The only manure is that produced from cattle, and this obtainable in limited quantities—firstly because of the small number of cattle, and secondly because of the scarcity of wood fuel—a large quantity of the dung of cattle being used as fuel for cooking.

The natives believe that the soil will take up to fifty cart loads of manure per acre if so much is forthcoming. The manure is stored in pits or in old fashioned manure heaps, and is carted to the fields and deposited in heaps at regular intervals, and then spread by hand and harrowed into the soil. This is done at the third harrowing. Jowar is not usually grown consecutively year after year in the same fields, as it is believed the soil will lose its productive power by so doing. There are some curious superstitions in regard to jowar sowing:—

(1.) The seed is not allowed to be winnowed (separated from the husk) or rubbed over with cow's urine, &c., in the presence of a woman who has applied Kajal (lampblack) to her eyes, nor is any female member of the family allowed to use Kajal from the time the sowing begins till it is complete.

(2.) The seed is carried to the field in an earthen pot to which chunam (lime) has been applied. A cowrie (shell) and a marking nut are tied with a cord made of hair and fastened to the neck of the pot so used.

(3.) A handful of seed in placed as an offering to the Village Marati before it is carried to the field to be sown.

(4.) Sundays, Wednesdays, and Fridays are considered to be auspicious days for jowar sowing but not the other days of the week, nor is sowing undertaken on a day of the week which is regarded as unlucky to the owner of the field according to his horoscope. On the day selected for the commencement of the sowing, the sower with his face either to the north or to the east begins his work.

Germination of the seed is delayed not only by excessive rain, but also when there is no rain. In the case of excessive rain the seed sometimes rots before germination takes place, while in the case of drought the seed becomes destroyed in the ground by excessive heat or through the attacks of insects. A moderate and opportune fall of rain is needed for successful germination. Weeding is done by the natives three or four times at intervals of a fortnight—the weeding being done with a hoe-harrow—the first weeding is done when the plants have two leaves, though there is no hard and fast rule as to the time of weeding, and the first operation is sometimes not performed till the plants are a foot high.

Weeding with the dowran (hoe-harrow) has the effect of loosening the soil and throwing it up against the plant so as to support and strengthen it. Weeds growing in the rows are removed by hand, and if the plants are too thick, they are thinned out by uprooting when the crop is below 2 feet high.

When cultivated for purposes of fodder, which is seldom the case, the seed is sown thickly, and the jowar stalks being consequently thin are cut before the ears are formed. There is a superstition about allowing such jowar to go into ear, the owner of the field regarding it as an evil omen. So the cultivator is careful to see that the crop is cut before the ears are formed. Such being the case, no one has ever attempted to ascertain what the yield would be if such crop were allowed to mature. In India the jowar crop comes into ear from three to four months from the time the seed is sown. Sometimes the disease known as gerva or rust appears when the rainfall is scanty.

Excessive cold and heavy dews sometimes are injurious.

The crop is generally ready for cutting about five months from the time it is sown. When all the grain in the ears has fully developed, and is becoming dry, the whole crop is cut. The stalks are allowed to lie in heaps for about eight days; after this period women are employed for the purpose of separating the ears from the stalks, and men tie the stalks into bundles.

Threshing begins as soon as the ears are found to be dry enough.

The juice of the jowar plant is never used for making sugar, nor is it considered possible to produce sugar from it.

In the province of Berar, the annual area under jowar is 2,352,250 acres, and it is estimated that 7,900 tons are annually sent out of the province. Jowar is the staple food grain of the province, and at the last census the population of Berar amounted to 2,897,040 souls.*

It is interesting to note that in the primitive system of farming followed by the natives of Berar, they have learned to a certain extent the value of cultivating between the rows, the benefits of clean cultivation, the advantage of rotation of crops, and the use of manure and of lime.

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* Jowar cultivation in Berar or the Hydorabad Assigned Districts, 1900. F. W. Francis, Director of Land Records and Agriculture.

Small quantities of the jowar or sorghums received from India were sown in January, 1899. They were inspected by Mr. W. S. Campbell, F.L.S., in April, while on tour in the northern districts with the Hon. Joseph Cook, M.L.A., Minister for Agriculture, and at that time showed an excellent growth of green fodder. Some seed was saved from these varieties, and a further sowing made in October, as I was of opinion spring-sowing would be most favourable to the development of the plants, the germination of the seed would take place at a congenial period, and ripening would be secured at an earlier period. The previous crop had been white rye, the land was ploughed and harrowed, and brought to a fine tilth, the seed being sown per medium of the Planet Junior Seed Drill, in rows 3 ft. 6 in. apart.

The varieties made a very prolific growth upwards, but some formed strong stalks, and not much foliage, *i.e.*, flag. As the object in view was to see what sort of green fodder these sorghums would make, the stalks were allowed to grow without interference in any way. In India, where they are grown for grain, the natives remove the lower leaves of the plant near the ground in order to help the nourishment absorbed by the plant at its roots to ascend and benefit the ears as they develop and mature. Some of the varieties as they matured had a very familiar appearance.

Amber Jowar resembles Amber Cane; Collur Jowar is very similar to Amber Jowar; and Imphi is much like one of our common sorghums.

Most of the varieties, if allowed to advance in growth beyond a certain stage, became exceedingly woody with strong stalks, resembling light bamboo almost.

The whole of the varieties when far advanced showed a tendency to rust, but there was no sign of rust up to the period the crop would be cut for green fodder.

The weight of some of the varieties when cut green was very heavy; in some cases no doubt due to the growth of the woody stalks already mentioned.

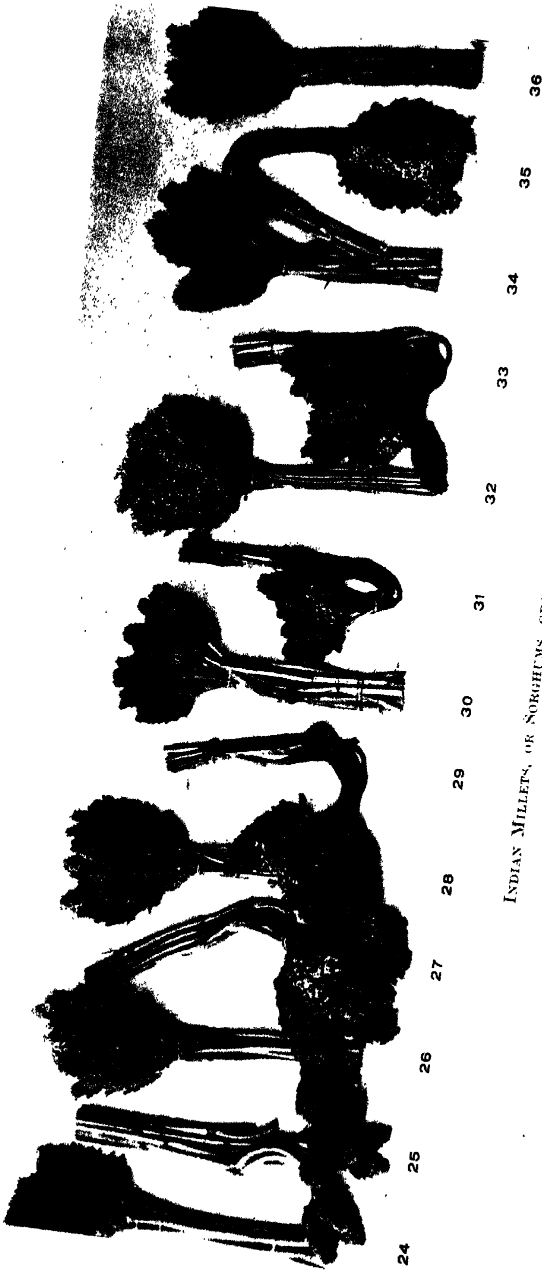
On the whole they were not remarkable for sweetness. The sweetest canes were Utawali, Collur Jowar, and Amber Jowar, Imphi, Javari Jola, Kar Jola, Farfaria, Rati, Dakshini.

In the tabulated statement annexed, I have endeavoured to differentiate the quality, so far as succulent green stuff went, by using the following terms:—

Fair, means only a moderate amount of green flag to the stalk.

Good, means a more plentiful amount of green flag to the stalk.

Heavy, or very heavy, means a large body of green flag, and the expression, "Good for cattle," is meant to simply convey the fact that in appearance the whole plant was fairly succulent; but so far as the feeding qualities go, *i.e.*, whether there is any property likely to bring about disorder in cattle, as is sometimes experienced in the case of green Planter's Friend, I cannot say. Some of the bundles of stuff cut for weighing were thrown to the few head of cattle on the farm without ill effects, but such stalks were beyond a very green stage.



Indian Millets, or Sorghums, grown at Wollongbar.

The varieties that appeared to be of most value were Collur Jowar, Amber Jowar, Dhawala, Rati, Imphi, Utawali, Javari Jola, Kar Jola, Mogar Wain, Sak Kar Mukkar, and these will be given a further trial.

In the tabulated statement there are a few varieties of which the weight in green fodder is not given; these had for some reason germinated very irregularly, and if cut and weighed the results would not have been a fair test. Some of the seed had been attacked with weevils while in store, and hence, I think, the inferiority.

The seed saved was sent to the Department of Agriculture, only a small quantity of each being retained for sowing again.

Date sown.	Date harvested.	Name.	Height of Stems.	Yield of Green Fodder per acre.	Yield of Seed per acre.	Remarks.
1899.	1900.		Feet.	T. ct. qr	lbs.	
16 Oct. ..	14 Feb.	Dowli	9	30 15 0	177	Good flag.
16 ,, .	15 ,, ..	Sakkar Mukkar	8	29 11 1	14¾	Very heavy flag.
16 ,, ..	24 ,,	Wain Perio.. ..	6	27 4 0	177	,, ,,
16 ,, ..	23 ,,	Kempu	9	26 19 1	354	Fair flag.
16 ,, ..	24 Apl...	Murgar	9	26 19 0	472	,,
16 ,, ..	24 ,, .	Yellaspuri	8	24 11 3	88½	,,
16 ,, ..	24 ,, ..	Utawali	12	23 13 0	354	Heavy flag; good for cattle.
16 ,, .	20 ,, ..	Collur Jowar .. .	10	23 13 0	531	Good flag; ,,
16 ,, ..	3 Mar...	Amber Jowar	10	23 13 0	1,416	Fair flag; ,,
16 ,, ..	23 Apl. .	Fulgar	9	22 14 1	531	Good flag
16 ,, .	23 ,, .	Nilwa (Poona)	11	22 9 2	531	Heavy flag.
16 ,, ..	25 ,, .	Badha Perio . .	5	22 9 2	354	,,
16 ,,	24 ,, ..	Imphi	11	21 5 3	767	Fair flag; good for cattle.
16 ,, ..	20 ,, ..	Gangad (Surat) .. .	10	18 18 2	767	Good flag.
16 ,, ..	13 Mar. .	Dhawala	11	17 5 2	413	,, good for cattle.
16 ,, ..	7 ,,	Dadia	5	17 5 2	177	Fair flag.
16 ,,	24 Apl.	Javari Jola.. . ..	8	16 11 1	295	Good flag; good for cattle.
16 ,, .	18 ,, ..	Mungari	7	16 11 1	177	Fair flag.
16 ,, .	23 ,, ..	Nirmali	7	16 11 1	59	,,
16 ,,	23 ,, .	Rati	8	15 7 2	177	Heavy flag
16 ,, ..	19 May ..	Kar Jola	11	15 7 2	118	,, good for cattle.
16 ,, ..	25 Apl...	Kachi Kachi	6	15 7 2	59	,,
16 ,, ..	20 ,, ..	Gund	8	14 13 1	14¾	Good flag.
16 ,, .	26 Mar. .	Kala Bondi (Khandest) ..	10	14 3 3	295	,,
16 ,, ..	20 Apl. .	Sadhi	10	14 3 3	147½	,,
16 ,, ..	26 Mar. .	Kala Bondi (Surat) ..	8	14 3 3	118	Fair flag.
16 ,, .	21 Apl...	Bile Jowar	11	13 0 1	413	Heavy flag.
16 ,, ..	12 Mar. .	Khondi	8	11 16 2	649	Good flag.
16 ,, .	24 Apl.	Garwa	6	10 12 3	118	,, fair for cattle.
16 ,, ..	21 ,, ..	Mogar Wain	6	10 8 0	236	,, good for cattle.
16 ,, ..	7 Mar...	Ratadia	5	9 9 1	177	Fair flag.
16 ,, ..	7 ,, .	Farfaria	5	7 1 3	177	,, fair cattle feed.
16 ,, ..	19 May ..	Kati	7	6 7 3	191¾	,, ,,
16 ,, ..	23 Apl...	Gario	8	......	177	Fair flag.
16 ,, ..	23 ,, .	Jowla	9	......	177	Good flag.
16 ,, ..	18 ,, .	Kondal	10	......	177	,,
16 ,, ..	18 ,, ..	Dakshini	8	......	177	Fair flag; fair cattle feed
16 ,, ..	23 ,, ..	Sholapuri	11	......	118	Fair flag.
16 ,, ..	23 ,, ..	White Wain .. .	11	......	118	,,
16 ,, ..	19 May ..	Perio	8	......	59	Good flag.
16 ,, ..	19 ,, ..	Chapti	10	......	59	,,
16 ,, ..	21 Apl...	Akowa	8	......	59	Fair flag.
16 ,, ..	23 ,, .	Sadgar	10	......	44¼	Good flag.
16 ,, ..	21 ,, ..	Neoria	10	......	29½	,,
16 ,, ..	23 ,, ..	Gangad	12	......	29½	Heavy flag.

Pasteurising Milk and Cream.

M. A. O'CALLAGHAN.

A chemical test to determine if milk or cream has been heated to 176° F. (80 C.) or over.

A GOOD deal has been written lately on the pasteurisation of milk and cream, and there seems a general feeling stealing over the dairying community in favour of the teaching of modern science. The word pasteurise appears to sound softer and softer to the ears of the dairy farmer and factory manager, and where twelve months ago we found doubt and hesitation we now find confidence and favour, and in other instances absolute antipathy has given place to doubt and inquiry. By-and-bye we hope to find the word pasteurise as familiar to the ears of the dairyman, and as well understood, as is the word cultivate.

We very often receive inquiries as to what is the proper temperature to employ in pasteurising. The answer is, the lowest temperature that will destroy all organisms that are in a germinating or growing stage. This is all we can expect to do by dairy factory pasteurisation. The spores or seeds we cannot hope to destroy by ordinary methods of pasteurisation. Just as a heavy frost withers and destroys the green leaves of many plants without affecting the seed thereof from a germinating point of view, so the pasteurising, or temporary heating, of milk, cream, or any other liquid to less than boiling point, while destroying the bacteria that have germinated into plants will not seriously injure the life of those organisms that are in the spore, or as it is sometimes called the resting stage. Let the severe frosts continue night after night for a little time, and the seeds as well as the leaves of most plants become destroyed; so it is if the pasteurisation be repeated day after day for three or four days— the spores as well as the full grown bacteria succumb. This is really what is called intermittent sterilisation. Needless to say, the temperature required for the destruction of any organism will depend on two things, viz., on the resisting power of the organism and on the length of time for which the heat is applied. In ordinary pasteurising machines the milk or cream remains (with the usual inflow) in the warm cistern about one minute and a-half; and hence what we want to know is what heat, when applied for about a minute, will destroy the ordinary vegetating organisms that are found in milk? It was at one time thought that if milk or cream was heated above 168 F., the coagulating point of albumen, a cooked taste would be found in the butter made from same. Experience has shown, however, that temperatures as high as 190° F. can be employed in modern pasteurising machines without imparting a cooked taste to the butter, provided the cream is cooled rapidly after Pasteurising to about 60° F. and then properly ripened by the aid of what is termed lactic ferment, or "starter," which is really a preparation containing myriads of the bacteria known as *bacilli acidi lactici.*

In 1895 the Danes employed a temperature as high as 178° F. for pasteurising cream, and since then they have adopted a still higher temperature, 185° F. being now a common temperature to employ. They, however, cool their cream immediately it issues from the pasteuriser to a low temperature, and then, after adding lactic ferment, allow it to ripen at between 65° and 70° F.

When the Danish Government made pasteurisation compulsory, the question arose as to how it could be determined whether the milk or cream had been heated to a sufficiently high temperature. Professor Storch came to the rescue with what is known as the paraphenylene-diamine and hydrogen peroxide test. When a trace of each of these substances (or a few drops of the solution thereof) is added to a tube containing fresh unpasteurised milk, and shaken, the whole assumes a blue colour; whereas, if the milk had been previously heated to over 176 F., the colour would have remained practically unchanged. In Richmond's Dairy Chemistry (p. 152), details of this test are given, and that author also mentions that "the hydrochloride of metaphenylene-diamine may be substituted with advantage for the para-compound. The coloration is paler, and not quite so quickly developed. By shaking with an equal volume of amyl alcohol the blue substance is dissolved in the alcohol layer, and the test is thus rendered more reliable in the presence of substances which modify the tint (*e.g.*, formaldehyde).

Mr. Pedersen (my field assistant) has made the following translation from Storch's leaflet on this test.

To perform this test the following solutions are required:—

(1.) A solution of paraphenylene-diamine, prepared by dissolving 1 part of the substance in 50 parts of warm distilled water, and filtering The solution is preserved in a drop-bottle of brown glass, and should be kept in a cool place. The solution slowly oxidises on keeping and becomes dark in colour, and as a rule becomes valueless after two months.

(2.) A solution of peroxide of hydrogen. As obtained in the trade it is generally stronger than is required, and can be diluted with five volumes of water, to which has been added a small portion of sulphuric acid (1 cc. concentrated sulphuric acid to 1000 cc. of water). This solution of peroxide of hydrogen should also be kept in a brown glass bottle.

A small test glass is also required; a test tube of about ½ inch wide and 5 inches long is most suitable for the purpose.

Take a teaspoonful of the milk, cream, or whey to be tested and empty it into the test glass. Add one drop of the solution of peroxide of hydrogen and two drops of paraphenylene-diamine solution; shake the glass so as to thoroughly mix the chemicals with the sample. If the milk, cream, or whey, is immediately strongly coloured (milk or cream, indigo blue; whey, violet) then it has not been heated above 173° F., or has not been heated at all. If the milk or cream is turned a light blue-grey colour, either at once or within half a minute after the addition of the chemicals, a temperature of 175° has been employed; while if the sample retains its white colour or only changes to a very weak violet-red colour, a temperature of 176° or over has been employed.

For buttermilk, a teaspoonful is taken and placed in a test glass, half a teaspoonful of clear lime water is added and well mixed with the buttermilk before the chemicals are added. If in this mixture of buttermilk and lime water a blue colour is produced on the addition of two drops of paraphenylene-diamine solution, and one drop of peroxide of hydrogen solution, then the cream from which it came had not been heated to 176°; if on the other hand, the buttermilk remains uncoloured, the cream had been heated to 176° F. or over.

To test butter, 25 grammes are weighed out and placed in a test glass of suitable size, and the butter is melted until clear, by keeping the glass in warm water at a temperature not exceeding 140° F. The clear fat is then poured off from the white sediment that has separated, and the latter is mixed with about an equal volume of water. The milk white fluid is then poured into a test glass, and one drop of peroxide of hydrogen solution and two drops of paraphenylene-diamine solution added. If the liquid becomes of a blue colour immediately after the addition of the chemicals, the cream from which the butter was made had not been subjected to a temperature of 176° F., while if it remains uncoloured, or changes only to a weak violet-red colour, the cream had been heated to 176° or over.

PROHIBITION AGAINST INTRODUCTION OF SHRUBS AND TREES INTO TASMANIA.

THE Government of Tasmania has issued a Proclamation prohibiting the introduction of all fruit-trees, cuttings, scions, buds, and grafts of fruit-trees, and the barberry, linden, enonymus, grape-vine, maple, acacias, rose, strawberry, raspberry, hawthorne, ash, gooseberry, currants, honeysuckle, lilac, privet, bignonia, elm, oak, birch, alder, chestnut, willow, and poplar, or cuttings, scions, buds, and grafts of any of the same. Plants other than the above may be introduced if accompanied by a certificate from the Government Inspector of the exporting Colony that the nursery in which said plants are grown is free from San Jose Scale, and that they have been fumigated with Hydrocyanic Acid Gas. Such plants can only be introduced at Hobart or Launceston, where they will be inspected and again fumigated. The regulations *re* fumigation, &c., do not apply to bulbs.

New Zealand as a Dairy Country.

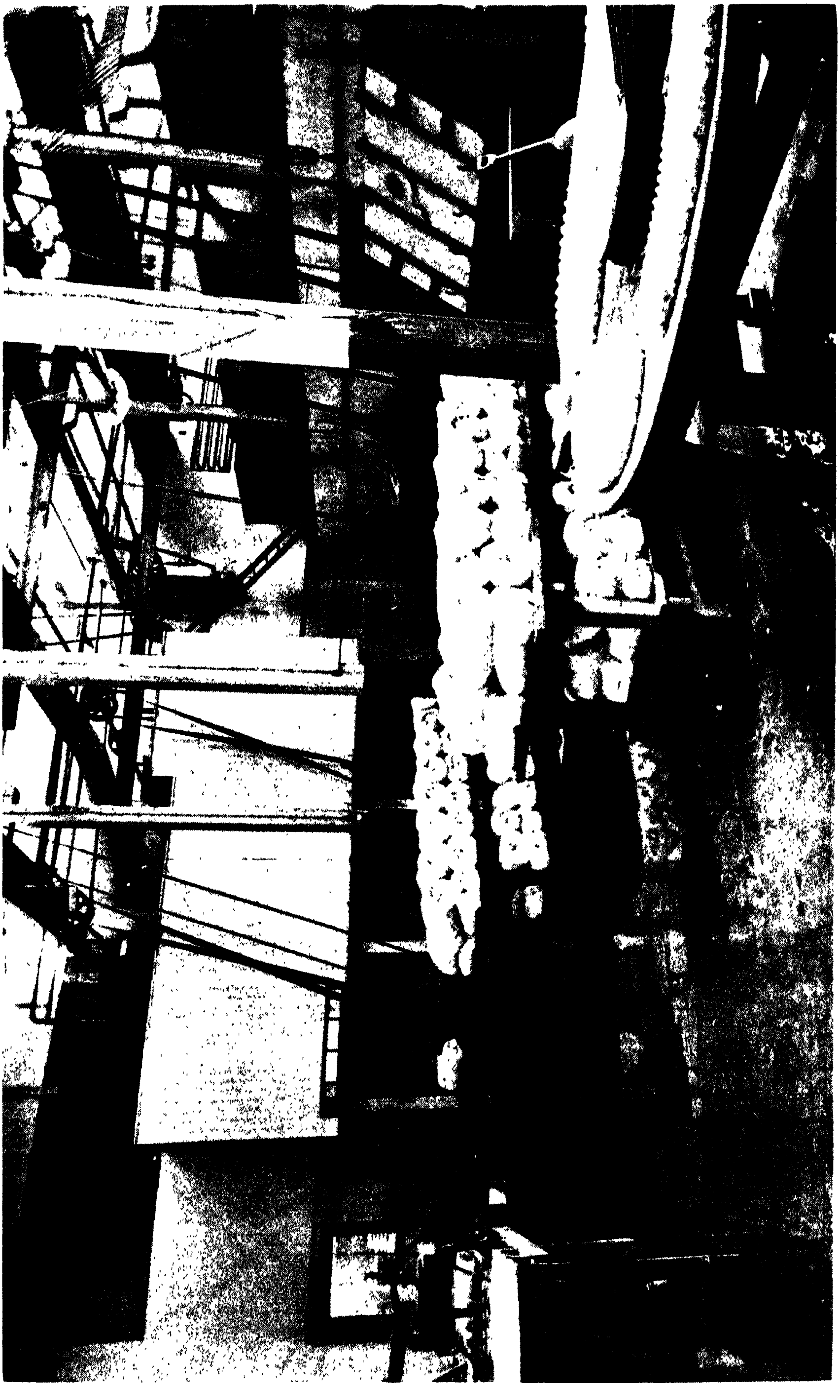
M. A. O'CALLAGHAN.

NATURE gave New Zealand undulating country, high mountains, fertile, soil, clear running streams, and a cool moist climate, thus making her not alone a fair land in which the tourist loves to wander; but a land eminently suited for pastoral life, and above all for dairy farming. In no countries will dairy cows be found to yield such large quantities of milk as in those in which frequent mists steal down from the hills, and gently moisten the plains below. The grass is freshened thereby, the young shoots grow tender and succulent, and the cattle grazing greedily thereon give a constant supply, and a large yield. With time when all the lands of New Zealand become sufficiently cleared from scrub and dead timber it should present an ideal picture of a dairy country. Its mountains intercept the winds and bring down rain; its mountain-fed streams afford that luxury in dairying, viz:—Clear, cool, running water for cattle to drink, and cold water for factory managers with which to cool their cream and wash their butter. The regularity of rainfall gives reliability as regards the character of the seasons, and the prevailing temperature being lower than in New South Wales the pasture lands do not get so burned up even when a dry season does come. On the other hand, the winters are very much more severe in New Zealand than they are here, and in the South Island the severity of the winters is undoubtedly a big draw back, because if cattle are to yield any milk at all they should be housed and hand fed, and the long winter means considerable labour, for crops must be grown to sustain the cattle during the severe months. Farming is, however, carried out on good lines there, and not alone do they grow enough feed for their own wants, but they export very largely to Australia besides. Winter serves one good purpose, it does away with that happy-go-lucky trust in Providence system of dairy farming carried on by many people in this Colony. Our winters here are seldom or ever severe enough to make hand-feeding an absolute necessity to the preservation of the lives of our dairy stock, hence we put our trust in Providence to give us a fine season, and having established this trust we make very little provision for feed during severe winters or droughts. The farmer in New Zealand knows for a certainty a cold winter is an annual occurrence, and he makes provision accordingly.

Cattle.

In this Colony one hears a great deal about New Zealand Ayrshires, and no doubt a good many Ayrshires have been imported from New Zealand to New South Wales, but, on the other hand, I do not think the New Zealand dairy farmers pay as much attention to the breeding and improvement of dairy cattle as do our people in this colony. There are very few breeders of really high-class dairy cattle to be found in New Zealand, the reason being that the prices obtained for the young animals are not sufficiently remunerative. The State also gives very little assistance to this section of the industry, all the State energy being devoted to the manufacturing and exporting side of the question. This is unwise, because on the cow mainly depends the first cost of the manufactured article; and if the cows yield too low a butter average per year, other competing countries can afford to undersell them considerably, and yet make profits. Let us take an example, and reckon the matter out. We will say there are two farmers—one living in New Zealand, and one in France. Each keeps fifty cows; the French cows average (say) 500 gallons of milk per year, and the New Zealand cows 400 gallons per year, and that each herd averages 2½ gallons of milk to 1 lb. of butter. The French farmer would thus get 10,000 lb. of butter where the New Zealand farmer only got 8,000 lb. If each farmer gets 10d. per lb. for their butter, the Frenchman would receive £416 13s. 4d., while the New Zealander would get but £333 6s. 8d. In fact, the Frenchman could afford, on these terms, to undersell the Maorilander by 2d. per lb., and still make as much money as the latter. Thus it is seen a halfpenny or a penny per lb. on butter (and Australians talk a great deal about our butter being a penny per lb. cheaper than Danish) is nothing compared to the difference in money value between a good herd and a bad herd of dairy cows. When we are often striving all we know to gain a farthing per lb., we are at the same time overlooking the question of two or three pence per lb. lost in another way. We have in New South Wales close on half a million dairy cows. If we can but raise the average yield of these cows (say) but 60 gallons per year—a feat by no means impossible—it will mean an increased income of £500,000 per year to our dairy farmers, and yet some people grumble because the State invests a few thousands in importing cattle to improve our stock. Another and a very material point in connection with this stock improvement question is that in New Zealand there is no such thing as Government subsidy to agricultural societies, and as a consequence there are very few agricultural shows. Our agricultural societies may not be doing the best work possible, but they stimulate a healthy rivalry towards improvement year after year between our stock-breeders, and they also serve to educate the farming public as to the best types of animals.

Coming to the question of manufacture, we find New Zealand has made rapid strides in butter-making recently, and her butter should be soon of as high a standard as her cheese. New Zealand has an excellent Dairy Inspection Act, and no doubt she owes a good deal of her excellence to the powers of the dairy instructors under this Act. Until very recently New Zealand factories were not fitted up with refrigerators, and even now only the largest butter factories are well provided for in this way. This is due to the fact that, save in parts of the North Island, such refrigeration is almost unnecessary, unless butter for export is made. Cold water is always easily obtainable with



A New Zealand Butter Factory.

which to wash the butter. This want of refrigeration is a weak point in New Zealand dairying, because, although water sufficiently cold for cooling cream to ordinary temperatures is obtainable, this will not suffice if butter for long keeping purposes is required, for then we need to reduce the temperature of the cream at some stage of the process to about 52 Fahr., and when made into butter a refrigerated room is required in which to place the butter soon after it has been made, and while awaiting despatch to the port of shipment. This weakness in refrigeration is, however, being quickly remedied, and when I next visit New Zealand I expect to find that butter is being manufactured only in refrigerated factories.

On another page will be seen a view of the inside of one of the most complete factories in New Zealand, viz., The T. and P. Dairy Factory, Dunedin. Factory managers should note the manner in which the butter is being worked on the table; too much butter has not been placed on the machine, and the butter is divided into separate lots, thus making it easy for the water to be worked out. This is the system of working adapted in all European factories, but it is seldom or ever done in this Colony, because it requires a little more exercise of the arms.

PUMPKINS AS A FODDER.

WRITING to the *Auckland News*, a farmer says: "My experience with the pumpkin is, all the animals that I have, including the cats, relish it; cooked or uncooked, every part, seeds and all, disappear quickly. For a number of years I have used various foods for dairy purposes—potatoes, turnips of several kinds, mangolds, also green maize. The root crops are costly to produce; too great a percentage of water in them. The mangold gives well-flavoured milk and butter when used or fed with good grass hay. The best results I obtained was from the pumpkin with grass hay and prairie-grass. Whatever the experience of others may be, my opinion is that the three abovementioned foods are superior to all others for dairying or fattening purposes. The pumpkin is highly nutritious, the prairie grass is far superior to any of the other grasses as hay, or used in the green state. The pumpkin is easy of cultivation, clean to handle, no cost of digging as in root crops. Should anyone elect to use the three foods, and after fair trial they find them more suitable and profitable foods, their advice and knowledge would be very acceptable. The most convenient method to produce the pumpkin and prairie-grass would be to grow both in one suitable paddock—say 3 acres—1 acre pumpkins, and 2 acres grass. When pumpkins are taken off, prepare for grass; break up 1 acre of grass, and use for pumpkins, or, in other words, use in rotation. A stack of good meadow hay as a stand-by is very desirable. The result will be, with a good shelter shed, good milk and butter, and rich manure."

Poultry Foods and Feeding.

J. J. McCUE.

To go fully into the subject of foods and feeding, would mean a book in itself; therefore, I will only touch on those points that are most important and easily understood.

Next to proper housing and cleanliness, food is the most important in poultry-raising. To be successful in feeding poultry, we should know that, however exact the knowledge of animal nutrition may become, and however thoroughly the practical poultry-keeper may be trained in his business, failure is sure to follow careless work and slovenly methods. We can accurately balance a ration in all its parts with the potential energy suited to the season or climate, and have the nutritive ratio properly adjusted for the work in hand; but irregular attention, undue exposure, vermin, cramped quarters, and many other causes—or any one of them—may undo all that the best food-compounder can devise. Science is but a help to good judgment—it goes all wrong when treated disrespectfully; but coupled with intelligence and energy it produces results as regularly and surely as that night follows day. With a thorough understanding of the principles of poultry-feeding, the poultry raiser may avoid the waste of much valuable materials in foods, as well as have proper control over his poultry. Feeding is an important item to the beginner. Many think it simple, but it is nothing of the kind, for all food given means *cash*. Food may return more than its cost, or it may be wasted, giving no profit whatever, or it may be so used as to be injurious. Fowls require a greater variety of food than most of our domestic animals. Animal and green food are essential, although the bulk of the food may be grain, or meals, pollard, &c. If there is one article of food more misused than any other in feeding poultry it is corn or maize. Its over-use produces a deposit of fat in all available parts of the body, which in time is likely to be followed by fatty degeneration of muscles and organs.

The value of a feeding material for the purpose of physical development is measured by the parts of substances in its composition, which have been found by experiments to readily submit to the digestive process. These substances, or nutriments as they are generally termed, comprise parts of many classes of organic compounds. Mineral matter is also necessary, particularly with laying hens; but, with the exceptions of lime and grit, these are all amply supplied in nearly all foods. The organic compounds are the most important food stuffs, and these have been classified as nearly as practicable in accordance with the special utility involved.

The food nutrients may be divided into three classes—water, carbonaceous, and nitrogenous. Water can hardly be classed as a food nutrient, it being more a constituent of food, or a carrier of food through the system; yet it is as important as any other of the nutrients. Carbonaceous foods, such as starch, sugar, fat, &c., are used for fattening, heat, and energy. Most fat-formers vary in nutritive value, the fat of green foods being of less value than that from matured seeds or their products. A carbonaceous ration forms fatty tissue, but not flesh or muscle; it keeps up the heat and movements of the body by the discharge of its potential energy during oxidation in the organism. Fat-formers, or heat-givers, are a kind of concentrated food, and are used principally as a reserve of heat and energy for the proverbial "rainy day."

Nitrogenous, or protein foods, include all substances in the foods which contain nitrogen in combination, and in matured products is principally in the form of albumenoids, such as white of an egg, gluten of wheat, &c. The function of protein in the animal economy is to build up those portions having a similar composition, though it may be used as a source of heat and energy. It forms the tissues, the framework of the body, keeps in repair the muscle and bone, and supplies albumenoids for the blood, eggs, and digestive fluids.

It is the most valuable component of foods, as it alone can do this special work, while the energy, heat, and fat may be derived from several other and cheaper sources. The fibre or fibrin of muscle and the albumen of egg are nearly the same in composition and general properties as the gluten of wheat. They all contain nitrogen in nearly the same proportion; therefore, when the fowl or animal consumes a food rich in nitrogen it introduces into its stomach the very substance of its muscles and blood; in fact, ready-made materials to build up and renew its several parts.

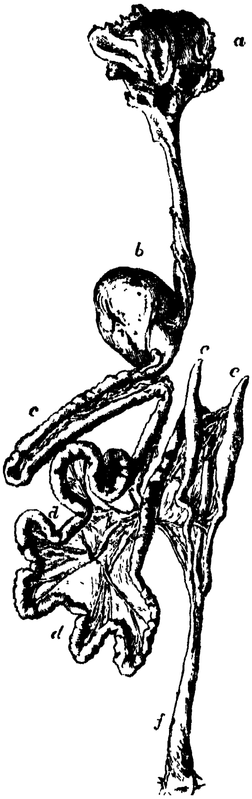
We feed poultry as well as other animals to keep up the vital force, the body converting the different nutrients in the food to its requirements. Besides the requirements of the body a certain amount of food is used for exercise, egg-production, fat-production, etc., and part goes out in the form of waste.

If we experiment with a well-fed fowl that has little or no exercise, we will find part of the nutrients—if the food has been assimilated—"stored up" in the shape of fat. Very often this "storing up" does not take the form of fat, but as an energy for future use, as in the case of pullets and hens when preparing for egg-production.

We should always remember that the body requires a certain amount of food for its own use; if that is properly supplied, and we feed an extra amount, we can expect a return from the hen in the shape of eggs, growth in young stock, and a fattened condition in table birds. Another fact that must not be forgotten, and that is—the body cannot store up more nutrients or energy than what we supply in the food. If we only supply sufficient nutrients in the food for the use of the body, then we cannot expect any return in the shape of eggs or profit. The income and outgo of the body in matter and energy should be balanced—except when fattening, when the income should be greater—and is "stored up" in the shape of fat.

Digestion.

The end or purpose of digestion is the same in all animals—that is, to provide materials for building up the body to a full size, and afterwards for enabling it to carry on its living functions without permanent loss of its own weight or substance. The digestive organs of the domestic fowl differ from the higher animals, the former having a first stomach or crop. The rough sketch below will give an idea of a fowl's digestive organs. [For the drawing prepared by Mr. McCue, the accompanying engraving which appeared in Dr. Cobb's article on Wormy Fowls, November, 1896, has been substituted.—Ed.]



Intestinal canal of the common fowl.
a, crop.
b, gizzard.
c, duodenum.
d, *d*, small intestine.
e, *e*, the two cæca.
f, cloaca.

The œsophagus or gullet at the lower part of the neck enters the first stomach, called the crop, which is a kind of enlarged bag or pouch enclosed by membranous walls; in this pouch the food remains for a certain time. Grain, seeds, etc., are retained in the crop, the crop juices—nearly the same as gastric juice—acting upon them till softened and made ready to pass on to the next stomach—the gizzard. I might mention here that the duck has no true crop, and it is absent in the ostrich.

In the gizzard or second stomach, chymification (the act of being formed into chyme or pulp) of the food is completed. This part of the digestive organs is furnished with a muscular covering, which has great power in granivorous birds. In this organ the fowl masticates its food with the aid of some form of grit—gravel, shell, etc.—the grit doing nearly the same duty as teeth in the higher animals. From the gizzard the food passes into the intestines, where most of the nutrients of the food are "taken up" and passes into the blood, and the part that escapes digestion is found in the droppings.

COMPOSITION OF POULTRY FOODS.

Kind of Food.	In 100 lb.					
	Water.	Ash.	Fibre.	Protein.	Nitrogen free Extract.	Fat.
Corn, or Maize	10·6	1·5	2·2	10·3	70·4	5·0
Barley	10·9	2·4	2·7	12·4	69·8	1·8
Oats	11·0	3·0	9·5	11·8	59·7	5·0
Rye	11·6	1·9	1·7	10·6	72·5	1·7
Rice	12·4	0·4	0·2	7·4	79·2	0·4
Buckwheat	12·6	2·0	8·7	10·0	64·5	2·2
Sunflower seed	8·6	2·6	29·9	16·3	21·4	21·2
Cowpea	14·8	3·2	4·1	20·8	55·7	1·4
Millet	13·3	2·6	7·7	11·4	61·3	3·7
Wheat	10·5	1·8	1·8	11·9	71·9	2·1
Wheat screenings	11·6	2·9	4·9	12·5	65·1	3·0
Corn-meal	15·0	1·4	1·9	9·2	68·7	3·8
Oatmeal	7·9	2·0	0·9	14·7	67·4	7·1
Barley-meal	11·9	2·6	6·5	10·5	66·3	2·2
Pea-meal	10·5	2·6	14·4	20·2	51·1	1·2
Linseed-meal	10·1	5·8	9·5	33·2	35·4	7·9
Animal-meal	5·1	28·6	......	40·0	......	28·6
Bran	11·9	5·8	9·0	15·4	53·9	4·0
Pollard	12·1	3·3	4·6	15·6	60·4	4·0
Dried blood	8·6	2·7	0·4	86·4	1·5	0·3
Fresh green bone	34·2	22·8	......	20·6	1·9	20·5
Skim milk	90·5	0·7	......	3·2	5·1	0·5
Curds	67·3	1·1	......	24·8	4·3	2·5
Potatoes	78·9	1·0	0·6	2·1	17·3	0·1
Turnips	90·5	0·8	1·2	1·1	6·2	0·2
Carrots	88·6	1·0	1·3	1·1	7·6	0·4
Cabbage	91·0	1·1	......	2·1	5·5	0·3
Lucerne (green)	71·8	2·7	7·4	4·3	12·3	1·0
Lucerne (hay)	8·4	7·4	25·0	14·8	44·2	2·6

From U.S. Agricultural Department Bulletins.

In studying the above analysis of foods, we find that science is a great aid in feeding poultry as well as other animals. Scientific feeding means an accurate knowledge of the constituents of foods, the principles and methods systematically applied in mixing and supplying the food.

Prof. G. C. Wilson tells us "that if fowls have comfortable quarters, the nutritive ratio of the food for laying hens should be about 1 : 4—that is, one part protein to four parts carbohydrates, or nitrogen—free extracts. With an analytical table before us, and this ratio in mind, it would seem an easy thing to pick out an ideal ration for our fowls that would be permanent. The table, however, gives the chemical composition, and not the digestibility, of the different foods. So far as I have knowledge, no one has up to the present writing given us a table showing the average digestibility of foods within the economy of the fowl."

As the Professor says, it is hard to pick out or make up an ideal ration for fowls. We might make up a ration containing the proper constituents to give a true balanced ration. If we experiment with this ratio of 1 : 4—that is, food containing or averaging one part of protein or muscle-producing compounds to four parts carbohydrates or heat and fat-producing compounds—we will find that the fowls get tired of it. We must vary their food, for the reason that the fowls' requirements are not always the same. Variety of foods is what a fowl requires, and these varieties of foods should be of a kind and composition that contain flesh and muscle-formers, heat-givers, and egg-producers.

The poultry-breeder should feed for an object—hens for egg-production; young birds, for growth; and birds for table, for weight and fat. If we were to give the table-bird's ration to the laying hen we would soon stop her egg-production; therefore, it is well to understand that a properly balanced ration for one fowl will not suit another. Again, we will find one hen in a pen differing from her mates, in the quantity of food eaten, the returns given, and even in taste and digestion; so we see how difficult it is to lay down any strict law of feeding. Climate, breed, and management has much to do with feeding. An observant poultry keeper should be able to test and find out in a short time the proper food and ration to give to his fowls. Some will say, "How are we to know that we are feeding our fowls properly?" This way: First, the fowl's droppings will inform you. A fowl in good health and condition will void droppings nearly dry; a fowl out of health and condition, will show a looseness in bowels. Half-fluid, yellowish droppings are signs of liver disease; greenish-black droppings, mixed with a reddish mucous, shows too heavy feeding of meaty and rich foods. Secondly, by catching the hens and examining for fat. Thirdly, if the hens are putting on fat instead of laying eggs, they are overfed or getting a fat-forming ration—not sufficient nitrogenous nutrients in the food used.

During the years 1898–99 I carried out a few experiments in feeding laying hens and pullets. The experiments lasted for a period of ninety days; and the breeds chosen for the experiments were:—In No. 1 pen, 6 brown Leghorn pullets and 1 two-year-old rooster; in No. 2 pen, 6 black Orpington pullets and 1 two-year-old rooster; in pen No. 3, 6 brown Leghorn hens and 1 cockerel; and in pen No. 4, 6 black Orpington hens and 1 cockerel.

The tabulated statements below give the kind of foods used, quantities used for each period of thirty days, the cost of foods, and number of eggs laid during the experiment.

EXPERIMENT NO. 1.

Number of Days.	Kinds of Foods used.						Average food for each bird, daily.	Total cost of food for each period of 30 days.	Average weight gained per bird.	No. of Eggs laid.
	Soft Food.	Green Food.	Dried Blood.	Wheat.	Maize.	Barley.				
	oz.		oz.	oz.	oz.	oz.	oz.	s. d.	oz.	
1st—30	560	Cabbage...	112	560	...	...	5·8	3 5½	1¼	92
2nd—30	560	Rape ...	112	420	168	...	6·0	3 6¾	2	126
3rd—30	560	Mixed ...	112	280	168	140	6·0	3 9¼	1	119
Totals, 90	1,680		336	1,260	336	140	...	10 9¼	...	337

EXPERIMENT NO. 2.

Number of Days.	Kinds of Foods used.						Average food for each bird, daily.	Total cost of food for each period of 30 days.	Average weight gained per bird.	No. of Eggs laid.
	Soft Food.	Green Food.	Ox Livers.	Wheat	Maize.	Oil Cake.				
	oz.		oz.	oz.	oz.	oz.	oz.	s. d.	oz.	
1st—30	560	Rape ...	224	...	504	112	6·6	4 1½	2¾	104
2nd—30	560	do ...	224	...	504	112	6·6	4 1½	4¼	91
3rd—30	560	do ...	224	...	504	112	6 6	4 1½	6¾	54
Totals, 90	1,680		672	...	1,512	336	...	12 4½	...	249

EXPERIMENT NO. 3.

Number of Days.	Kinds of Foods used.						Average food for each bird, daily.	Total cost of food for each period of 30 days.	Average weight gained per bird.	No. of Eggs laid.
	Soft Food.	Green Food.	Green cut Bone.	Morning—Wheat.	Evening—Maize.	Barley.				
	oz.		oz.	oz.	oz.	oz.	oz.	s. d.	oz.	
1st—30	...	Mixed ...	224	560	560	...	6·4	5 7	3	76
2nd—30	...	do ...	224	560	560	...	6·4	5 7	3¼	21
3rd—30	...	do ...	224	560	560	...	6·4	5 7	4½	7
Totals, 90	...		672	1,680	1,680	...	...	16 9	...	104

EXPERIMENT No. 4.

Number of Days.	Kinds of Foods used.						Average food for each fowl, daily.	Total cost of food for each period of 30 days.	Average weight gained per bird.	No. of Eggs laid.
	Soft Food.	Green Food.	Green cut Bone.	Wheat.	Maize.	Barley.				
	oz.		oz.	oz.	oz.	oz.	oz.	s. d.	oz.	
1st—30	560	Cabbage...	224	420	168	...	6·5	4 11¼	1¼	76
2nd—30	560	Lucerne...	224	280	168	140	6·5	5 1¾	2	130
3rd—30	560	Rape ...	224	280	168	140	6.5	5 1¾	1¾	89
Totals, 90	1,680	...	672	980	504	280	...	15 2¾	...	295

If we refer to the above experiments we will notice that No. 1 feeding was a fairly nitrogenous one; and the average quantity of food used per head was fairly high feeding for Leghorns. The food rations for No. 2 pen were more carbonaceous than for No. 1 pen. The birds in No. 2 gained in weight from beginning to the end of experiment. As the birds put on fat the egg-production lowered. The birds in No. 2 used a greater average quantity of food than No. 1.

The ration of No. 3 pen was a grain-feeding experiment, using wheat in the morning and maize at night. This was the dearest feeding of the four experiments, and the least productive. The hens in this pen put on fat weekly from beginning to end of experiments, and egg-production fell off as well. A few days after the experiment of ninety days all the hens were done laying, and one died with over-fat.

The feeding of pen No. 4 was conducted with foods that are supposed to be the best for egg-production, and was fairly balanced to give good results. This pen of fowls had a good appetite all through the experiment, and consumed a shade more food daily than the other pens. The egg-production was better than in Nos. 3 or 2, but not as good as No. 1 pen.

We find the best results from No. 1 pen, where dried blood was used for animal food; it being cheaper than green-cut bone. No. 3 was the dearest feeding of the four, and poorest returns; No. 4 next dearest feeding, and not as good as No. 1 in egg-production.

The cost of foods used were arrived at by charging the following prices:—

Pollard	at 9d.	per bushel of	20 lb.
Bran	at 9d.	,, ,, ,,	20 lb.
Wheat	at 3s.	,, ,, ,,	60 lb.
Maize	at 3s.	,, ,, ,,	56 lb.
Barley	at 3s.	,, ,, ,,	40 lb.
Oil-cake	at 6s.	,, ,, ,,	112 lb.
Ox livers	at 2s.	,, ,, ,,	112 lb.
Dried blood	at 6s.	,, ,, ,,	112 lb.
Green cut bone	at 1½d	,, ,, ,,	1 lb.

The green food was not charged for, nor was it weighed. Each pen was fed amply daily. (I may say the cabbage was waste leaves, and rape—young plants that were thinned out of crops; so cost of green food was actually small.) Grit was also supplied in the ordinary "shell grit" form, and the quantity used for the ninety days was of so small a weight that I did not bother in trying to place the amount in pence.

The gain in weight of fowls was arrived at by weighing each bird separately in early morning, before feeding—on the 30th, 60th, and 90th days—the increase above original weight at end of each period of thirty days being struck for an average. For instance, the six pullets in No. 1 pen weighed 4½, 4¼, 4¾, 4, 4½, and 5 lb. respectively at commencement of experiment. These weights totalled an average of 4½ lb. per bird, the same rule being followed at end of each period of thirty days, and the increase in weight noted.

The soft food consisted of 6 parts pollard and 2 of bran mixed into a nice crumbly state. The dried blood was softened in boiling water, the blood and water being used to mix the pollard and bran. When not using the blood, the dry meals were mixed with hot water or soup. I might mention here that no deduction was allowed for weight of water or soup used in mixing the soft food, the weight of soft food being charged for as if it were in the dry meal state. In feeding the grain foods, special care was taken that the fowls were compelled to exercise by scratching, the grain being placed under a fair depth of straw.

If we compare the returns from the four pens we find the following results:—

No. 1 Pen.		No. 2 Pen.		No. 3 Pen.		No. 4 Pen.	
Dr.	*Cr.*	*Dr.*	*Cr.*	*Dr.*	*Cr.*	*Dr.*	*Cr.*
Cost of food.	Eggs, 337.	Cost of food.	Eggs, 249.	Cost of food.	Eggs, 104.	Cost of food.	Eggs, 295.
£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
0 10 9¼	1 8 1 0 10 9¼	0 12 4½	1 4 6 0 12 4½	0 16 9 0 8 8	0 8 8	0 15 2¾	1 4 7 0 15 2¾
	0 17 3¾		0 12 1½	0 8 1			0 9 4¼

Reckoning the eggs at 1s. per dozen, we find that No. 1 pen gave the best profit above cost of food; and No. 2 pen the next best profit. No. 3 pen gave no profit, but was indebted 8s. 1d. The birds gained in weight, but that cannot be reckoned as profitable in a laying pen. No. 4 pen gave a profit of 9s. 4¼d. above cost of food, which is not a proper profit for cost of food given.

We find the best results from the dried blood, which does not cost as much as green cut bone. After a number of experiments with dried blood and green cut bone, I found the best egg production came from the pen that used the dry blood. My attention was first called to dried blood when looking over an analysis of animal foods, and comparing with green cut bone. In the first instance there is no comparison in green cut bone with dried blood, for egg producing qualities. We find in green cut bone 34·2 water 22·8 ash (which is a bone former) 20·6 protein, 1·9 nitrogen, and 20·5 fat. In dried blood we find only 8·6 water, 2·7 ash, 0·4 fibre, 86·4 protein, 1·5 nitrogen, and only 0·3 fat—fat formers; so we find in green cut bone 77·5 out of every 100 lb. almost useless for egg-production; the 34·2 of water can be supplied in a cheaper form; the 22·8 of ash is not all required; and the 20·5 of fat is not all required, so is useless when eggs are wanted. In dried blood we find a fairly balanced animal food for egg-production—not an excessive quantity of water, ash, or fats.

I have had many letters from correspondents whom I advised to test the dried blood ration, and all have agreed as to its being a splendid animal food for egg-production. There is one thing connected with dried blood that must not be forgotten, and that is its over-use. Twice-a-week is often enough to use it in the soft food, and the quantity will depend upon the number of fowls. A fair quantity for each fowl at each meal would be about 1 oz. in the dry state. I have had letters from poultry-keepers who use as much as 2 oz. at a meal; and have received an increase in eggs by so doing. That may be so, but it is at the cost of the hen, for she cannot stand such forcing for more than one season. I believe in a fair, properly balanced ration, no forcing. When you go beyond a certain limit in feeding for egg-production, you commence to injure the hen, which is not only cruel, but improper feeding.

In placing the above experiments before my readers, I do so with the hope that they only be taken as experiments; for one, two, or even three experiments do not always prove that the results are correct in all parts. In feeding fowls for certain results, we can only use what we have on hand, and are limited to one district's climate; therefore, our most correctly carried-out experiments cannot be taken as the only one to be followed. Yet, much is gained from these experiments; it enables others to test them; and the feeding of the different foods, and quantities, give us a good idea of which are the best to use to get good results.

Feeding fowls—like chickens—is one of the most perplexing studies that a poultry-breeder has to deal with. There are so many systems and methods of feeding that the poultry-breeder is in a fog to know which is the best. "McCue" will give his system and method of feeding; Mr. Brown will give his; Messrs. Jones, Robertson, and Smith will give theirs; then, the poultry-breeder is in a fix, to know which man he should follow. If the poultry-breeder tries to test all these men's methods, the chances are, before he is half through with them, he hears of another method, and "knocks off" to try the new one. After a few months' or a year's work at this experimenting to find out a proper food, he generally has found out for himself the feeding and methods that suit him best. But there is one thing to be considered while these experiments are being carried out, and that is the fowls. Many forget that it is a live animal they are experimenting on, or do not think that any injury is being done while "practising" on them to find out the proper food. A hen may be likened to a machine in that she utilises her food—fuel—for heat energy, etc.; but we should never forget that the fowl has taste and feelings, which will not bear abuse any more than our own will.

None of us are quite satisfied at our feeding results, for the simple reason we hear of so many good methods, and we find one breed or pen of fowls doing well on a certain ration, while others do not do so well. Why is this the case? For the reason that different fowls require different feeding. It is very seldom we get two pens of fowls give the same results from the foods given. One pen may use a little more grain than the other; or require a little more animal food than the other. These and many other little things are the ones to be watched, if we wish to get the maximum profits above cost of foods. Exercise is one of the secrets of success; it has much to do with the results from food given. Another point is not to over-feed, but to have the fowls a little hungry; never have any food left on the ground after each meal.

We often hear the question, "What is the proper quantity of food to give a hen or fowl at a meal?" No person can answer this correctly or exactly, for hens differ in appetite the same as ourselves. Another thing, you seldom get six hens in the same pen with the same taste or appetite; for the simple reason their wants or requirements differ. Take a pen of six pullets of the same age for illustration. These pullets, although hatched on the same day, may differ in time of arriving at maturity, or of egg production. The pullet that has not matured requires a different food—flesh and bone former—to the pullet that is preparing for egg production, or is already laying. To get the best returns from the food given we must try to find out what it is that each fowl or breed requires. If we do this, success will surely follow our feeding methods.

BAKED LAND.

A good many people who experience great difficulty in working land that bakes readily after rain may be interested in the following advice issued by the Texas Agricultural Experiment Station:—

"There are several things which can be done to improve your land, the choice of which one, or of a combination of two or more, will depend upon your local surroundings. Subsoil ploughing will prove of benefit. If you combine with this a considerable quantity of lime, say at the rate of one-half ton per acre, it will perhaps prove more beneficial than anything else that you could do. But as this may be too expensive you may find it necessary to try this: Deep ploughing, eight to ten inches, and the application at the same time of large quantities of swamp muck, barnyard manure or any fertiliser rich in vegetable mould. Green manuring, that is ploughing under a green crop of any kind of forage or luxuriant growth, is a practical method of great value. Wood ashes in large quantities, two or three tons to the acre, will prove very beneficial. This is perhaps the only remedy which would prove of any value so late in the season as it is now. The deep ploughing and heavy dressings of manure should be done not later than midwinter."

The Washington Navel Orange.

The following particulars concerning the origin and introduction into California of the variety of practically seedless navel oranges that have won such fame under the name of "Washington Navel" appeared in the *Scientific American* of recent date. They are now reproduced at the suggestion of Mr. C. W. Darley, who feels sure that orange-growers in this Colony, where the variety is already engaging great attention, will be interested.

Twenty-five years ago there were no seedless, or navel oranges grown. A few oranges were raised in Florida, but the bulk of the supply came from the Mediterranean, and the fruit was expensive. The annual yield of California oranges was less than five carloads. Now the annual orange yield in California is upward of 15,000 carloads, and the total amount invested is now something like $43,000,000, while twenty-five years ago it was only $23,000. The introduction of the seedless, or navel orange has caused these changes. It has revolutionised the orange industry of the United States, drawing 13,000 men out of other pursuits, and has transformed vast areas of sun-baked land in California into beautiful orange groves. The New York *Sun* recently had an interesting article on this subject, from which we derive our information.

The first seedless orange-trees were introduced in 1872 through the efforts of William F. Judson, United States Consul of Bahia, Brazil, who heard from the natives of a few trees in the swamp on the north bank of the Amazon, some 60 miles inward, which had no seeds. It seems that even in those days there were consuls who were interested in scientific matters, and could foresee the economic value of a discovery of this kind. He sent a native up the river to get some shoots, and bring back some of the fruit. Several of the shoots were packed in moss and clay, and were shipped to the Agricultural Department at Washington. They did not excite very much attention at first, but the next year Mr. Horatio Tibbetts asked the Agricultural Department for specimens of fruit and shrubs suitable for experimental propagation in Southern California. Among other things Mr. Tibbetts obtained the four surviving orange-tree shoots from Brazil. They were shipped to Riverside, California, and were immediately planted. Even here the shoots appeared to have had bad luck; one died of neglect and another was chewed up by a cow. Five years passed, and the two surviving trees came into bearing, and in the winter of 1878–79 they bore sixteen oranges of the seedless variety—the first ever grown in North America. Specimens were shown to orangemen and fruit-growers. At first they were sceptical as to whether the trees would bear annually such fine specimens. The second crop was awaited with great anxiety. There was about a box of oranges in the second year's crop, and they were even better than those of the first crop. Mr. Tibbetts was sure that there was a fortune in the new variety of oranges. For two years he experimented with propagating trees from shoots and cutting from his two seedless trees. His attempts were a failure, but finally he hit upon a scheme of budding from the seedless navel trees upon the seedling trees. Experiments along that line were successful, and it was found that a bud taken from one of the two Tibbetts trees and grafted into the bark of a seedling tree would grow to be a limb which would grow seedless oranges. The original orange branches were then cut away and the tree thereafter bore only the new variety of fruit. Work was carried on in earnest in the winter of 1882, and in the following year the demand for buds was so large that a dozen frequently sold for $5 and $1 each was finally not considered excessive for a good bud. A fence was built around the two trees to protect them, and a year or two later the orange-trees that had been propagated from the two original trees began to bear, and they furnished tens of thousands of navel buds, which were as good as those from the two original trees. The industry has grown until now no one thinks of planting seedling oranges, and tens of thousands of seedling trees have been budded into navel orange-trees, and there are many navel orange groves in the region which have yielded net profits of from $250 to $300 an acre a year. Riverside has grown from a hamlet of less than thirty American inhabitants to a prosperous town with 14,000 population. It is the greatest orange-producing locality in the world, 16,000 acres of the land being devoted to it. The average annual shipments of the oranges from Riverside are 1,600,000 boxes. The Riverside citizens are now urging that the two trees which were the source of this prosperity be removed to a public park, and suitably protected in order that they be kept for the next generation as an object lesson. No visitor is allowed to take any flower or fruit into the orchards for fear of the scale.

Concerning the culture of the Washington Navel orange in New South Wales, Mr. W. J. Allen, Fruit Expert, states: In this Colony the trees do not attain great size. They prefer a good, deep soil, and will not do well at all in hard, gravelly clays, such as one often meets with in our metropolitan fruit districts.

Introduction of American Varieties of Maize.

GEORGE VALDER.

In view of the fact that numerous complaints had been received from farmers in several of the maize-growing districts of the Colony, that it was extremely difficult to obtain pure seed of the quick-maturing varieties of maize; and further, that many so-called early varieties, such as Ninety-Day, had apparently gradually developed into anything but early varieties,—the Department decided to import seed of new quick-maturing sorts from America. Orders for seed were sent through the Departments of Agriculture of the United States and Canada, and in July last year seed of the following nine varieties were received:—

Clarke's Mastodon.
Riley's Favorite.
Hickory King.
Iowa Gold-mine.
Iowa Silver-mine.
Star Leaming.
Pride of the North.
Longfellow Dent.
Legal Tender.

This seed was made up into 1 lb. packets and distributed to farmers in all parts of the maize-growing districts. Unfortunately the season proved to be anything but a favourable one for their trial. In several districts the late frosts either destroyed the early-sown crops or so stunted them that they did not mature, and in others the season was so hot and dry that most of the farmers cut their crops for either green fodder or ensilage. In a few of the districts, however, very satisfactory crops were obtained, and from the reports received from farmers, and from the results of the trials at the Hawkesbury Agricultural College Farm, the following notes have been gathered:—

Longfellow Dent.—As a quick-maturing variety this is likely to become a general favourite. Satisfactory reports were received regarding it from nearly all the districts. It is earlier and apparently a heavier cropper than our varieties of maize. The plants grow strongly and evenly, and on most of the stalks the cobs were large and well-formed. The grain is of medium length and is of the small and yellow Dent type; the core is red. On comparing the samples grown in the Colony with the original samples, it was at once seen that there was a marked improvement in colour, plumpness, and length of grain.

Pride of the North.—This variety gave very satisfactory results. It is a small, quick-growing, yellow Dent corn, of much the same quality as the former variety. The grain is bright in colour, and has a very good appearance for market purposes. The yield was nearly as heavy as that of Longfellow Dent, and in some instances it was quite equal to it.

Iowa Gold-mine.—Also an excellent early variety of the same class as the former two, but with a deeper grain. Several reports state that it gave the heaviest yield of all, but in some districts it did not nearly equal two or three of the other varieties.

Star Leaming.—Of much the same class as the former varieties, but the grain is flatter and wider, and the yield varied considerably. In the colder districts it gave a really good return, but in many of the others the crop was decidedly light.

Clarke's Mastodon, Riley's Favorite, and *Legal Tender* are also of the small yellow Dent types. As a rule, they did not yield as well as the other varieties, although at this farm Clarke's Mastodon gave a comparatively good crop, and the grain was of excellent quality.

Hickory King.—This is a strong-growing variety, yielding heavy crops of fine large grain. It is of the White Dent type, medium early, and should be valuable as a grain-producer and also for ensilage or green fodder.

Iowa Silver-mine.—Also a white variety of the small Dent type. One of the heaviest croppers, with grain of excellent quality. Not so strong in growth as Hickory King, but much earlier.

When the seed was first distributed, it was noticed that it was not nearly equal to our Australian samples, and several farmers' wrote stating that the grain was poor in quality. Most of the samples were small, and had rather a pinched appearance. It was anticipated, however, that when the varieties became acclimatised they would improve in this respect, and this has been fully borne out. Nearly all the samples grown from the American seed and sent to the Department, when compared with the original samples, showed a decided improvement, the grain, in most instances, being larger, well-developed, and having a much better appearance for market purposes. Several of the yellow varieties, and both of the white ones, are likely to prove exceedingly valuable additions to those under cultivation here, and I feel sure that in many districts they will entirely supplant the old varieties. Some few farmers have reported that they had saved a considerable quantity of seed and intend to plant on a large scale this season. Provided the weather is favourable, there is every chance of a further improvement in the yield and quality of these varieties, and, should this take place, there should be plenty of seed available next year.

The following are a few of the many interesting reports forwarded to the Department:—

Mr. C. A. Cork, Hon. Sec., Ulladulla Agricultural Association, says:—"I obtained seed of the imported maize, and distributed it among some thirty-three farmers. On inquiry, I find that while some of the growers are well satisfied, others are not; but the consensus of opinion is that it will do far better next sowing. One point on which all agree is that most of the varieties are a distinct improvement, inasmuch as they ripen fully a month earlier than the local sorts, which, in my opinion, is a great advantage to the farmers here, allowing them to utilise the same ground for a winter crop. Whether this advantage will be retained after the maize has been acclimatised remains to be proved."

MR. J. W. FARLOW, of Freeman's Reach, Hawkesbury River, reports:—"The yield obtained from samples sent was as follows:—

Legal Tender	12 rods	4½ bushels
Pride of the North	12 ,, ...	4¾ ,,
Star Leaming	Poor crop.	
Iowa Silver-mine	12 rods	4 bushels
Hickory King...	11 ,, ...	3 ,,
Longfellow Dent	12 ,, ...	5 ,,

"The latter is, I think, the best of the six varieties. Hickory King is the most suitable for green fodder and ensilage."

MR. C. A. MUNDAY, of Riverholme, Bonshaw, says:—"The season here was a very bad one, the late frosts, followed by the hot, dry weather, doing much damage to the crops. The seed received was sown on 10th September, and harvested on the 10th February, with the following result from 1 lb. of seed of each variety:—

Pride of the North ...	199 lb....	68 lb. of cobs yielded	56 lb. clean grain.
Iowa Gold-mine	255 lb....	66½ lb. ,,	56 lb. ,,
Longfellow Dent... ...	230 lb....	68 lb. ,,	56 lb. ,,

"I estimate that the late frosts reduced the yield by fully one-fourth."

MR. J. R. HATCHER, of Inverell, reports that two varieties he tried, viz., Longfellow Dent and Pride of the North, did very well, and that in good seasons he is of opinion that they would prove heavy yielders and mature early. From the 1 lb. samples sent he obtained about 6 bushels each of good sound corn. The Longfellow Dent he describes as having a very long cob, with small core, and as being slightly earlier than Pride of the North, the latter variety having a rather short thick cob with good deep grain.

From MR. GEO. ADAMS, of Yarramalong, *via* Wyong:—"I have planted the following kinds of seed maize which I received from your Department last year, Iowa Gold-mine, Iowa Silver-mine, and the Pride of the North. It did not come up well, being very irregular. It was planted singly, and not several in a hill, the way generally practised in this district. However, what did come up did fairly well, especially the first-named two kinds, the Iowa Silver-mine doing much the best. I do not think that the Pride of the North will do much here as it was badly affected by the weevils while the crop was standing in the field. I intend to plant pretty freely of the Gold and Silver Mines the ensuing season, as I believe that when acclimatised to this soil, they will be a great acquisition, inasmuch as the crop sown in October was ripe in February. The stalks not growing very high and the cobs low down, renders it extremely easy to gather, and generally there are two cobs on each stalk."

From Mr. Geo. Hargrave, Braeside, Armidale:—"I planted the following varieties of seed, Iowa Silver-mine, Iowa Gold-mine, Star Leaming, and Longfellow Dent; area planted, about $\frac{1}{8}$ acre of each kind; yield about 5 bushels for each plot. Iowa Silver-mine I consider the best, with the Star Leaming the second, and Longfellow Dent next. The Iowa Gold-mine has not done so well. All had the same cultivation. All are good maizes for this district, with its hot summer. Late frosts and dry summer have reduced yield. These four kinds matured as early here as the Ninety-day or Queen of Prairies, and produced double the crop."

Mr. W. Grainger, of Stratheden, Casino, reports that—"Last year I received seed of three varieties of the imported American maize, viz., Iowa Silver-mine, Iowa Gold-mine, and Star Leaming, which I planted on the 25th of October. All the varieties tasselled in six weeks from sowing, the Silver-mine showing first. The samples harvested were fully equal to the imported sample. Consequent upon a dry spell, the yield by appearance would be only about 25 bushels to the acre; but the acclimatised varieties suffered to a like extent. There is much to recommend the varieties named, all of which ripen nearly eight weeks earlier than the varieties generally grown here. While growing, the leaves are few and far apart, hanging loosely upon the stalk, the cob also stands well out, showing that degeneration has not set in yet—a feature that is very noticeable in ordinary seed. The fact of maturing early is of great benefit where weeds and nut-grass are troublesome. The Silver-mine (a pure white) is a remarkably good sample, and it is a pity its colour prejudices its market value. It is a full, plump and flinty grain, full of meal, and, therefore, the most profitable to the consumer. I intend to try a 5-acre patch of the Silver-mine this season, and also a quantity of the other varieties. I may add I divided the above varieties, planting the respective parts on scrub and forest land, the samples and yield being about the same on each soil."

Trials of Potatoes at Wagga Experimental Farm.

G. M. McKEOWN.

THE land occupied by the crop comprised an area of 6 acres, and the soil, a fairly deep red loam, which had borne a crop of wheat the previous season, was deeply ploughed, and brought into a fine condition.

The drills were struck out 3 feet apart, and the potatoes, which were cut into sets, were placed about 15 inches apart in the drills.

The soil not being of good quality, all of the varieties, with the exception of Brownell's Beauty, were manured with Carlisle's G. Sovereign manure at the rate of 2 cwt. per acre, costing, inclusive of freight, 17s. per acre.

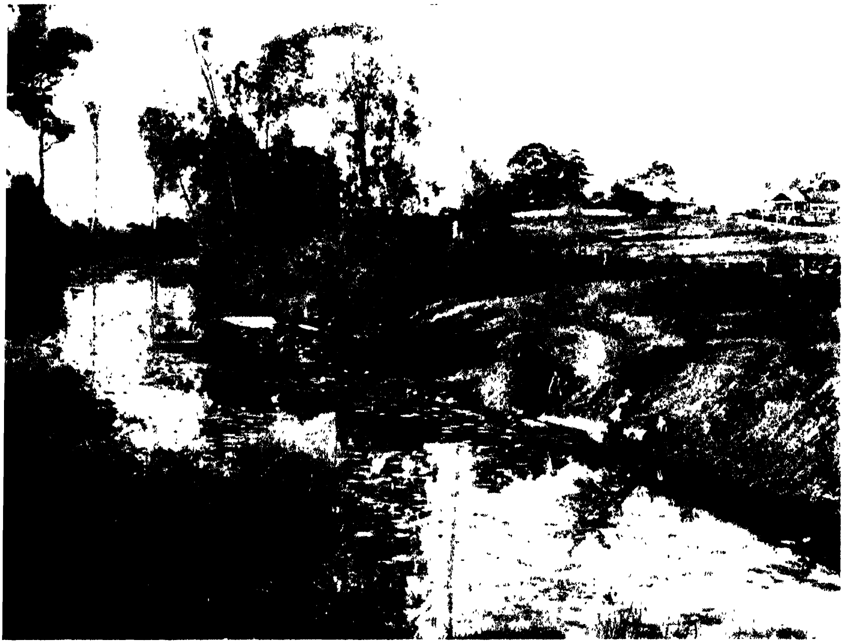
The Brownell's were divided into three equal parts, one part being unmanured. The second part was treated with G. manure at 2 cwt. per acre, and the remainder with the manure at 4 cwt. per acre for the purpose of comparing results.

The potatoes were planted in August, but September proved a dry month. A fair rainfall occurred in October and November, but later in the latter month adverse conditions set in, high temperatures prevailing with frequent hot winds.

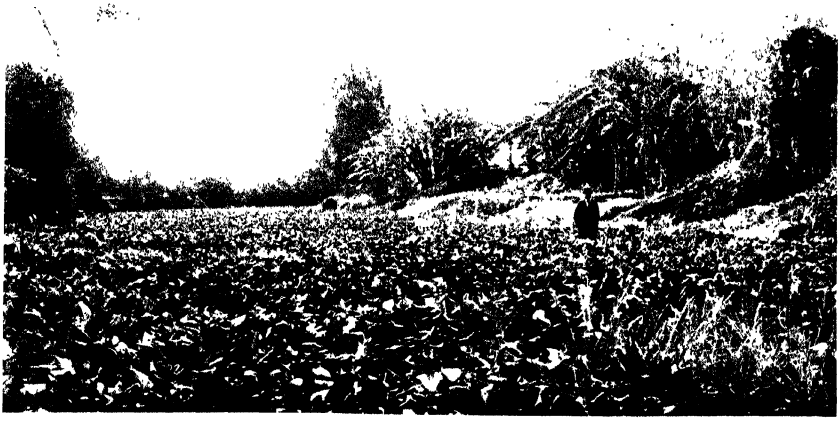
The rainfall, from time of planting to harvest, was 488 points, of which only 68 points fell during the seven weeks preceding harvest.

Locusts also attacked the plants, in some cases destroying the whole of the foliage, thus preventing the tubers from attaining full size. This was especially the case with the later varieties.

Variety.	Per Acre. Tons	cwt.	qr.	lb.
Australian Monarch	2	6	1	16
Scotch Grey	2	3	0	14
Adirondack	2	2	2	19
Beauty of Hebron	2	1	2	26
Goulburn Redskin	2	1	0	8
Early Rose	1	18	1	21
Magnum Bonum	1	7	1	2
Bliss' Triumph...	1	7	0	0
Lord Tennyson	1	3	3	18
Brownell's Beauty, unmanured	0	16	3	4
„ manured 2 cwt. per acre ...	1	5	1	16
„ „ 4 „ „ ...	1	17	2	22



CREEK, NEAR GRAFTON, TWO YEARS AGO.



SAME CREEK AT PRESENT TIME, INFESTED WITH WATER HYACINTH.

The Spread of the Water Hyacinth.

FOLLOWING on the warnings that have appeared from time to time in the *Agricultural Gazette* as to the danger of permitting the water hyacinth to become established in any of our northern streams, the Department has received from Mr. C. Ebeling, of Grafton, photographs, as reproduced on the opposite page, which show how serious the matter is.

Mr. Ebeling has been good enough to furnish the following details:—

"The photographs were taken by Mr. J. F. C. Goodridge, surveyor at Grafton.

"The first illustration shows Swan Creek (four miles from Grafton) as it was a couple of years ago with a few natural water lilies and no hyacinth.

"The second photograph depicts the same stream this season, and speaks for itself. Mr. G. Small is standing on the growth of hyacinths, 12 feet from the bank, on a 6-inch board with 11 feet of water under him."

If the spread of the plant were to be allowed to go on unchecked, it is manifest that before many seasons passed, the waters of the northern rivers and their tributaries would be absolutely closed to navigation. If everyone who comes across a clump of hyacinth would immediately take steps to remove it or report the discovery to some one who would destroy the pest, the evil might be nipped in the bud at small expense and trouble.

Floods will simply aggravate the evil so far as the spread of the pest is concerned, because every little plant that becomes detached from the parent mass and is swept into clear water will take root, and in an incredibly short time, as these photographs show, take possession of acres of water.

Pig Farming on the Paddock System.

W. H. CLARKE.

On several occasions agriculturists in correspondence with the Department have expressed the intention of trying, in a systematic way, the raising of pigs on cultivated crops, grown in regular rotation, and into which the animals are turned to "cut their own feed."

There can be no question that such a system is the best one for a colony like ours. Pork from animals kept in unclean, crowded yards, and fed entirely on grain, milk, or offal alone will never produce high-class, firm bacon and hams, and in all probability costs more per lb. to raise than where the pigs are supplied with a wholesome rotation of food, and are afforded a chance of keeping themselves clean and healthy. But if the system of paddocking be attempted, care must be taken to set about it in the right way. It is not the sort of industry that can be satisfactorily conducted in conjunction with anything else. The man undertaking it will require to have a fair knowledge of practical farming and as much training as he can acquire at a place like the Hawkesbury Agricultural College piggery or elsewhere. He must be quite prepared to make the comfort and happiness of his pigs the sole aim of his life. Then he will make money.

In choosing a district for the establishment of such a farm, it would be necessary to look out for a place close handy to a dairy separating station so that you can get supplies in time of need, and with cheap means of access to a bacon-curing factory, such as exist in the North and South Coast districts, or to a shipping port.

One cannot travel through any of our coastal dairying districts without observing dozens of little patches of country that would make ideal sites for small pig farms on the paddock system—rich soil, well-watered creeks, fairly-abundant rainfall, cheap transit, and everything that a man with about £500 capital and his thoughts centred on pigs could desire to make a rattling good living. It is not argued that pig-raising is a more exalted and easier occupation than anything else, or that all a man need do is to secure a piece of land, get some pigs, and let 'm run to gold; but no one who takes an interest in such affairs can read the opinions of farmers and experts in Denmark and Canada, which countries contribute so great a share of the thousands of tons of bacon and hams imported by Great Britain annually, or observe how strenuously Mr. Loudon Douglas, who probably knows more about the bacon trade than any one else, is striving to induce the farmers of England to pay more attention to pigs, without coming to the conclusion that, as an industry of good profits and quick returns, the production of bacon and hams stands very high indeed. When one comes to compare the conditions under which the producers in cold countries have to work, with the facilities that our more temperate climate places at our feet, it must be admitted that in pig-raising New South Wales has just been skirmishing around its possibilites.

On nearly every holding worthy of the name of farm, there is a pig-sty—often a place of unspeakable horror, stuck away in some remote corner, occupied by a few pigs—that is nothing more or less than a garbage tip or filthy bog. This simply because Mr. Pig is regarded as a mere subsidiary. But that sort of thing does not pay. If New South Wales bacon is going to take its proper place in the front rank of the world's markets, it will be necessary to raise, as they do in Canada, pigs by tens of thousands, and of such uniform excellence as to look, as one Canadian bacon manufacturer puts it, "as if they were all turned out of the same mould." To do that, a man must make pigs his chief consideration, and although the advice usually tendered to agriculturists is, "Do not put all your eggs in one basket," it is well to remember that in the world's competition the specialist is the man who makes most money. People with experience in pig raising will laugh when they read these remarks, and perhaps say, "Oh, on paper it is easy to dump down that friend of yours with his £500, and prove that in almost no time he will be able to clear £300 a year or so." At any rate, just let us see what steps he should take, and how it would be necessary for him to work to make a living, and something over.

Say he takes up a small area of Government land. The conditions under which he can do this are liberal and very simple, as he will find upon inquiry at the Lands Department or any of the local Lands Offices. He will probably be able to enter into possession at a first expenditure of some £30, with the balance to be paid in instalments. Clearing will be a bit of a facer, but if careful search be made, it will be possible to secure a nook where this will not be more than a couple or three pounds per acre. Say he spends the balance of the first £100 in clearing at first, and extends the area as opportunity occurs and as his pigs increase in number. £70 ought to clear a pretty good patch, and provide the bulk of the fencing stuff. There is nothing to be gained (except a few pounds worth of fencing, which will be lost in other directions) in having the paddocks too large. The area devoted to pig-raising should be laid out in long narrow paddocks.* Here it might be as well to give the following rough sketch of the laying out, with view to easy working:—

First of all there will be the dwelling. That is usually a matter of taste, but as in a good many of the districts best adapted for intensive pig-farming there is good timber and a sawmill, the chances are that a handy man ought to be able to put up a little place good enough to start with for £50. He now has the ground, a dwelling, a cleared patch, and a heap of fencing stuff and perhaps slabs, and £350 cash.

The next thing will be to fence off his first paddock and get in a crop of maize, if the season will permit of it, or of something else, like potatoes or rape, that will do pretty well in roughly broken virgin soil.

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* See article on pigs by Mr. George Valder, Principal of the Hawkesbury Agricultural College. (*Agricultural Gazette*, pp. 188, 298, Vol. X.)

If there is natural feed for a horse, a light draught one and cart and harness as well as a plough might be procured at the outset; but if feed has to be bought, it would be far better to scratch in the first acre or two of crop with a hoe. While that is coming along one pig pen and sty could be made ready, and as soon as a supply of feed is assured a first-class pure-bred yearling boar and ten or more well selected pure or grade sows should be obtained. The chances are that these and a bit of purchased feed of some kind to supplement the grown crop, with carriage and so on, will run away with £50. During the next six months the rest of the pens might be completed, a couple more paddocks fenced and planted. This taking the best part of the year will be all dead work, and will make a big hole in the £300 or so left after buying the stud pigs.

It will always be found the cheapest to get the first ploughing done by contract; then a single horse, with the assistance of a second one later on, ought to be able to keep things going. A suitable horse ought to be procurable for about £12, a cart of all work for about the same, and a set of harness for about £5. A plough and harrow will probably cost, with repairs, &c., about £12, and a couple of 1,000-gallon tanks, with guttering, &c., a boiler and setting, chaff-cutter, grain-crusher, and odds and ends, will probably run into another £25.

By the time that about five paddocks are fenced and planted, and about £30 has been expended on a combined barn, stable, and cart shed, there ought to be a good many young pigs, ranging up to 150 or 160 lb., ready for market.

So much for the theory. Now for some explanation of the *modus operandi*. First of all, what crops are there that will thrive in the coastal districts and produce pork ?

Crops to Grow.

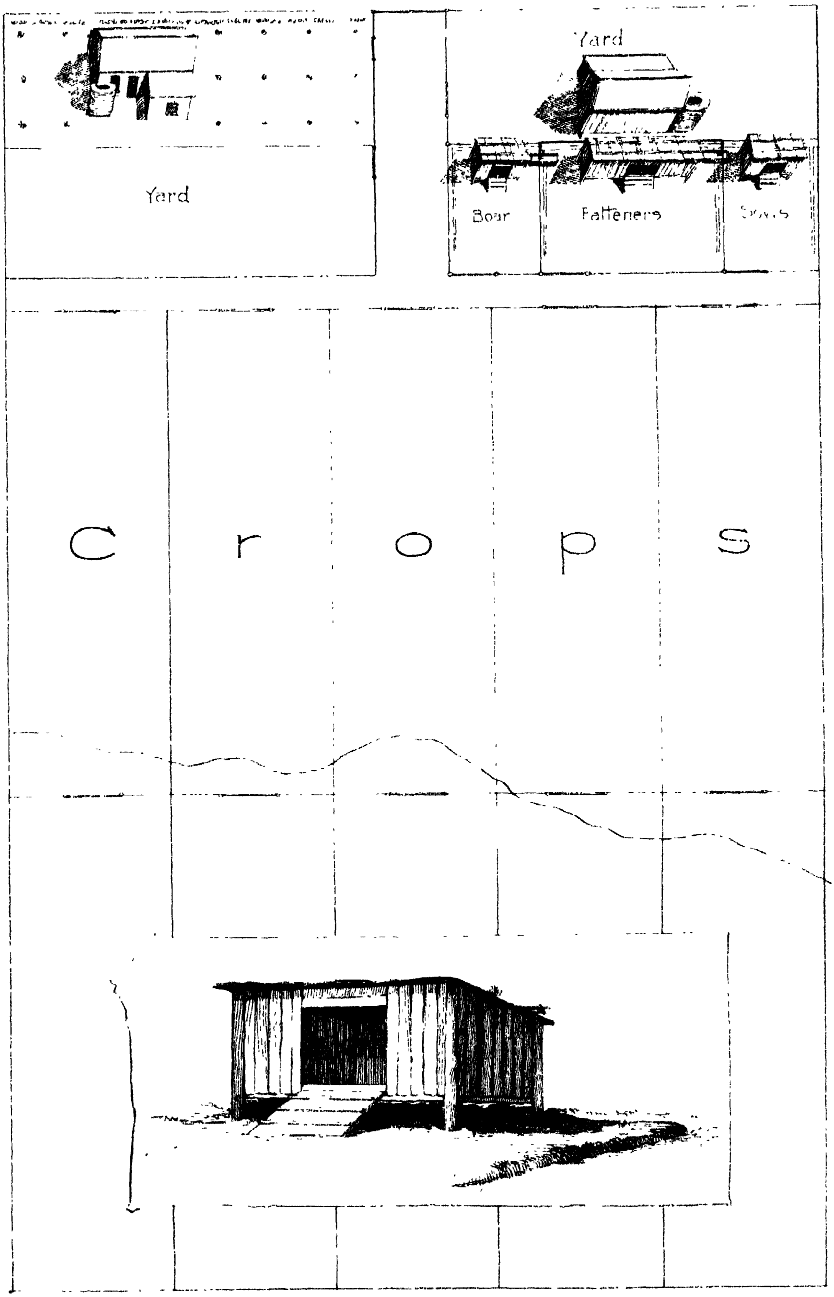
In the northern portion of the coastal district, there are, according to the experience of all the authorities consulted, for—

Spring-planting.
- Sugar-beets.
- Maize.
- Cowpeas.
- Mangolds.
- Sweet potatoes.
- Artichokes.
- Lucerne.
- Pumpkins and squashes.
- Melons.
- Ground nuts.

Autumn-planting.
- Rape.
- Vetches and barley.
- Lucerne.
- Oats.
- Grasses.
- Wheat for grain.

Summer-planting.
- Maize.
- Kale.
- Sorghum.
- Field peas.
- Turnips.

Winter-planting.
- Potatoes.
- Oats.
- Peas.
- Wheat for green feed.



A PLAN OF A PIG FARM

For the southern portion pretty well the same list would do, and surely with a range of all these crops it ought to be possible for a lively sort of a man, giving his whole attention to the matter, to keep 300 young pigs a year with their bellies full; especially when it is remembered that, once under systematic sowing, the pigs would not only do the harvesting but manure the land as well; so that under climatic conditions at all favourable the yields of each class of crops would be bounteous. From all that can be gathered it seems a fair estimate to compute the feeding capacity of a well grown crop of any of the kinds mentioned at eight to ten pigs per acre. In practice it will probably be found that more can be carried, because the condition aimed at in the paddocks is not "mud fat," but "forward store" condition. In the *Agricultural Gazette* for December, 1898, an article on bacon-curing, by Mr. Douglas, was reproduced. In it, special reference was made to what is known by the standard name of "Wiltshire"—lean, mild-cured—bacon, running in the best quality to an average of 57 lb. per side. To produce this class of article the young pigs must neither be unduly forced nor starved. The result of over-feeding is the production of pork that is of no more value, with all its flabby fatness, than the other extreme, which culminates in an article known to the English trade as "skin and misery", at least the Canadian Live Stock Commissioner, Mr. F. W. Hodson, says it is.

Thus it will be seen that the principle to work upon is the provision of sufficient food to build up a healthy young frame, which can be rounded up to the desired thickness by a month or less feeding on special food. The moment a pig is ready for the curer, he should be despatched. Uniformity of production will be the very essence of any export trade that can be worked up, and although there may be some kudos attached to the production of a carcase of pork that is more hollow ground than a razor or as heavy as a Shorthorn bull, it is necessary to remember that the people at the other side, who are ready to pay top price, are not interested in anything but that which long custom and vigilant catering have placed in the position of the suitable article. But I am afraid our friend will be lost in the bush, and we must leave this bacon-curing racket to be written upon by some one more experienced in it.

In the lay-out it will be observed that the breeders' pen or pens is placed well away from the road and gateway, so that no sudden rattling of a cart or unusual noise may disturb the sows. The boar's court is placed at the roadway and where it is handy to toddle across from the house to give him all the sorts of dainties in the shape of table scraps, etc., that will keep him in good condition. The pen marked "fatteners" would be used for keeping the market pigs in while they are being topped off with maize, wheat, or other hard feed for about a month. It is presumed the depastured youngsters would be carefully watched and as soon as one appeared to be sufficiently forward for topping off, he would be confined to the yard. The barn, in which would be stored all the grain, roots, pumpkins, etc., allowed to ripen, it will be noticed, is placed pretty near the pens. This would be done for the double purpose of saving labour in feeding; and from the roof it would in all probability be possible to catch enough water to keep the pen troughs full by gravitation and a ball-tap. Pigs require clean water to drink, and in summer time a patch of mud to wallow in to keep off insects. Where well-raised troughs that would be kept filled automatically are used, there is economy of water, and the necessary mud patch can always be provided by running the waste resulting from periodical cleansing of the troughs into a convenient corner of the yard.

And talking about yards, it is seldom one ever sees a pig-pen that is properly drained. A drain, as shown in the diagram, can be cut out in a few hours; it is little trouble to keep it clear so as to prevent the yards in winter becoming a horrid puddle, and the best part of the manure being washed goodness knows where.

Trouble in this respect could also be avoided by having a little bit of plain guttering and a few feet of downpipe on the roofs of the sty, or, as shown in the figure, by digging a drain to carry off the roof drips. For the depastured pigs, water and shelter must be provided in each paddock. The first might be provided for, if there is not a creek running through the paddock, by excavating long narrow holes in the lowest portion of the area. But it will be found that when on juicy crops they will not require much water. The best sort of shelters can be provided in lean-to bark-roofed structures placed on the weather side of the fence. The floor should be well raised above the surrounding ground to keep out soakage, and it does not matter much how low the weather side is so long as it keeps out the wind and the rain. It is not a bit of good growing a crop for a pig to fatten on and then let exposure to cold and wet force him to draw upon what ought to be being turned into pork to keep up body heat.

In next issue there will be shown illustrations of several inexpensive but durable pig-proof fences with other details of value to beginners in this industry.

In connection with crops for pigs, the following remarks by a Victorian farmer, Mr. J. C. Suffren, in correspondence with the *Leader*, may be of interest:—

> Many of the ailments among pigs are brought about in the first place by indigestion; often the result of too much grain in the diet. Grass, ground peas, turnips, carrots, mangels, sugar beets, potatoes, and artichokes are all good, healthy, economical pig feeds, and the more the pig receives the healthier will he be. Every practical pig raiser will admit that growing pigs and fattening pigs do very much better on mixed feed. Many are now feeding artichokes, turnips, peas, potatoes, &c. After some experience in growing artichokes I have concluded that they are by far the cheapest, most healthful and most easily grown pig food yet discovered. Last spring I planted a field of them on old worn ground, without manuring, and obtained a good yield. The artichoke is also a sure crop in dry years. About the time pastures fail in the autumn, the artichokes are ready for the pigs. Artichokes are grown nearly the same as potatoes. They may be pastured from late in autumn up to the beginning of summer. Artichokes are very easily exterminated by ploughing the young plants under when about a foot high. Or if the field is sown to oats, when the oats are cut, the artichoke tops will also be cut, and this effects complete extermination. I have tried several sorts of artichokes, and conclude that the Mammoth White French, White Jerusalem and Red Jerusalem varieties are best.

The City Agriculturist

W. H. CLARKE.

MOST of the matter that is written in reference to the treatment of soils and fruit-trees is based upon the assumption that the land is just reclaimed from the bush and that the trees are young. A trip along any of the railway lines or roads in the county of Cumberland will reveal numberless holdings that are either abandoned or are fast becoming a wilderness of weeds and stark, moss-clad, and unproductive trees. Such places are usually avoided to such an extent by would-be buyers or tenants of land that, at the last pinch, the owners are ready to take almost any price. A good many people shake their heads when an apparently worn-out farm or orchard is discussed, and will assure you that such areas are dear at any price. That is as it may be; but surely something can be done with them. At the present time every run-down, neglected plantation, by reason of the harbour it affords to pests that spread from it in every direction to healthy orchards, is a serious drag upon the enterprise and hard work of painstaking fruit-growers; and since there appears to be no practicable way of destroying such hot-beds of trouble, perhaps people will be found willing to occupy and restore them if it can be shown that the undertaking is not a forlorn hope.

Supposing we take a typical spot. Twenty years ago it was planted out with summer fruit and oranges. The old folks have died and the young ones have married, and so on, leaving the orchard to the ravages of weeds and disease. In the first place, and from the stand-point of merely so many acres of land, such an area at £20 per acre is cheaper than a timbered tract at £30 per acre. If the neglected fruit-trees, as in most cases they probably will be, are beyond redemption, they can be grubbed out for as many shillings per acre as natural forest will cost pounds. The soil will, it almost goes without saying, be choked with couch and other vegetation that is difficult to eradicate. For a year or so, and until the very heart has been torn out of the grass and weeds by ploughing and cross-ploughing, followed in each instance by harrowing and cross-harrowing, with perhaps scarification every few weeks for three months at a stretch, to add manure in any form to such land would be to make matters worse. As soon as the weeds get sick and fail to come up to time, the task of infusing new life into the soil can be commenced by a dressing of at least 2 tons of lime per acre. Then a leguminous crop, sown thickly with fertiliser, should be sown and turned under, or, if procurable at anything like a reasonable cost, about fifteen loads of ordinary stable manure, or three loads of sheep manure, thoroughly rotted, per acre, should be turned under.

This seems a good deal to have to do, and we will stop here and tot up the outlay—

	£	s.	d.
Ploughing...	1	0	0
Harrowing	0	10	0
Cross ploughing	1	0	0
,, harrowing	0	10	0
Scarifying, four times	0	12	0
	£3	12	0

Clearing out the dead and dying fruit-trees will probably cost 10s. per acre; so that, for an outlay of (say) £4 per acre, you have an area of soil that is in fair mechanical condition, and is fairly free from weeds and impediments to cultivation.

At this stage it might be possible to subsoil cheaply, because even if the land had been imperfectly cleared in the first instance, the greater number of stumps and roots left in would have rotted or become "rocky" in twenty years. At all events, the cost of the operation in land such as that now in question would be extremely small as compared with subsoiling new ground.

Liming will be the first operation. Agricultural lime (containing 70 per cent. purity), delivered on the land, may be averaged at £1 per ton; builder's lime (containing 93 per cent. purity, according to published analyses), something under £2 per ton delivered. £2 worth of either will be an ample dressing; and if it costs 10s. per acre to spread and work it in, that amount may be regarded as the maximum.

The effect of the lime will be to correct the stoginess of the lower layer of surface soil, and to impart a greasier feel and appearance to the layer of a couple of inches which has become set and impoverished by cultural neglect. Some little time ago there was a discussion in one of the American papers as to whether weeds growing unrestrained on land enrich or impoverish it. Possibly, by the natural decay of portion of the noxious vegetation, quantities of vegetable matter are deposited in the soil; but in the case of many of the weeds most common in neglected plantations, the seeds, which are responsible for the greatest drain upon the fertility of the soil, are borne off by the wind, and the plants themselves in decomposition produce an incredibly small amount of matter that may or may not be turned to good account. Possibly, some of the deep-rooted weeds which die completely at the close of their season do have some remote influence for good. At all events, the condition of the soil of a long-neglected and weed-infested place, as it suggests itself to the non-scientific man, is "deadness." To overcome this, as has been shown, requires an expenditure, of (say) culture, £4, and liming, £2 10s. It is now a problem whether there is in the soil sufficient dormant fertility which will be rendered available for plant-food by the thorough cultivation and liming, or whether it will be necessary to apply manure to ensure the production of a crop sufficiently luxuriant to be worth turning under to provide at least some of the humus that will be indispensable to enable the run-down soil to retain moisture. If manure is used, and there is scarcely a hope that it will not be absolutely necessary, bone-dust is about the best that can be suggested as a first dressing.

Where trees are to be planted out on the reclaimed patch, it is well to lay out the ground (missing the old spots) in the interval between liming and sowing the first green crop. Then the soil immediately about the place where the young tree will be planted can be given a pretty liberal dose of manure, and if anything has to go short through an insufficient supply of fertiliser being procurable, it will not be the trees that suffer. After that, the land should be seeded all over, and what manure is available can be dusted on previous to harrowing on some moist day after the crop shows above ground. This will probably bring the expenditure per acre up to something like £9, made up as follows :—

	per acre.		
Clearing out old trees	£0	10	0
Ploughing	1	0	0
Harrowing	0	10	0
Cross-ploughing	1	0	0
Harrowing	0	10	0
Scarifying (four times)	0	12	0
Lime, spreading and harrowing in	2	10	0
Bone dust	1	10	0
(6 cwt. per acre; 5 lb. per tree space, and at the rate of 1½ cwt. for the intervening portions)			
Seed of green crop and planting it	0	12	0
Turning under green crop	1	0	0

In return for this outlay of some £9 per acre during the first year of occupation, there is a soil that is in good heart and ready to produce profitable crops with no more manure than would be necessary in the case of a fairly rich virgin soil. That such will be the case in every instance is not contended, for the simple reason that in decadence, like in everything else, there are many different stages ; but very often a person in search of a site for a farm or orchard is confronted with the difficulty of choosing between a tract of worn land and a tract of virgin forest. If, by the expenditure just shown, it would be possible to get the worn-out soil into a condition equal in productiveness to virgin land as it is broken up immediately after clearing, the restoration of abandoned soil is just as good and profitable an undertaking as the clearing of virgin land. But, apart from this matter of mere pecuniary outlay, we have to take into consideration the fact that a good many orchards have been allowed to go to the dogs simply because their plantation in that particular site was a mistake ; the soil may never have had any heart, the underlay may be of some objectionable composition, the situation may be too exposed—a dozen things, apart altogether from effort, or want of effort, on the part of the orchardist himself, may have contributed to the disastrous result. Still, if the choice rests between an abandoned site in the vicinity of flourishing plantations, and within reasonable distance of the railway or other ready means of access, and a patch of heavily timbered bush land not so accessible, the beginner of small means, to whom returns within the shortest possible time are a matter of concern, can be safely recommended to devote serious attention to the acquirement of the readily cleared areas. The whole question is, however, one that requires some years of careful investigation ; still, it is safe to assume that on every tract of really decent land there are orchards and farms that one man cannot live on and another may work with success. This article is not meant to go any further than to open up the subject. The two main problems to be solved in the reclamation of a neglected or worn-out plantation are—(1) The restoration of the soil, which comes within the province of the Chemist, Mr. F. B. Guthrie; (2) The reworking of vigorous but unproductive trees, which the Fruit Expert, Mr. W. J. Allen, will write upon.

INCREASING THE YIELD OF CORN.

WE know that the yield of corn may be increased by careful selection of seed grown under the best methods, and by the best preparation of the soil; also by the liberal use of the right fertilisers, and by frequent cultivation. We have also learned that some good may be done by repetition of this fertilising and cultivation until the most exacting time of the growth of this exceedingly vigorous plant has passed. That in fact it is feeding as long as it is growing, and that during the time it is making growth it needs to be supplied with available and digestible food and plenty of air to be breathed and taken into the leaves, and doubtless the roots, from which to get the material for the large quantity of starch and fat which go to make this grain so valuable for feeding.

Mr. Henry Stewart, writing in the *American Agriculturist*, says:

> Thus the old practice of laying by the corn when it is knee high and then letting it rustle for itself, is not by any means up to the times. It has then barely made a fourth of its growth. The plan of then stopping the feeding is much like the starving of a calf as soon as it has sucked the cow dry, and then letting it get what it can from the roadsides and the waste lots.
>
> The common yield of corn is 30 bus. to the acre. Perhaps one-half the fields average much less than this, and only a small portion of the land goes up to 50 bus. to the acre. But it is as easy to get 100 bus. per acre as it is to get 50, by simply doing a little more in the good culture of the crop and at a very small additional expense. It is a mere question of feeding the plant. And this is done by giving a moderate quantity of fertiliser at intervals when the land is cultivated until the work can no longer be done on account of the vigorous growth. My crops have given one-third more with eight cultivations than with three, which is the common practice, and more than double with 50 lb. of the complete manure at three intervals up to the time the grain is forming and the silks are dry. This time is the most exacting period of the growth of the crop, and it is a remarkable fact as showing how this food helps even at this late time to nourish the plant—that the ears of the late worked and fertilised crop are always filled out to the tip, while the other corn has most of the ends bare of grain. This tells considerably in the shelling and in the weight of the crop.
>
> In weighing some of my corn of last year's crop I find the fully fertilised ears weigh 80 lb. to the heaped 2-bushel, while the other ears worked but three times and fertilised but once, weigh 70 lb. to the same measure. This difference is due to the complete filling out of the ears the tip. Of course this increases the measure scarcely at all, but it adds so much to the weight, and it is this that tells. The seed from such a crop is more valuable, and I have been giving 1 bushel of these selected ears for 2 of common corn, they being in great demand for seed. And knowing that I grow such corn the neighbours all want seed from my best ears. The time when the corn needs help most is when it is 18 in. high, then when the tassels begin to appear, then when the silks begin to show, and once more at the last time it is possible to go through the rows with a horse or mule.

Bee Calendar.

ALBERT GALE.

SEPTEMBER.

OWING to our great range of climate, what may be applicable to apiculture in one district may be quite out of season in another; therefore, the advice given here will be understood to be nearly according to the district.

It is hardly necessary to remind beekeepers that the first consideration should be the keeping of the stocks strong. This matter should have been seen to during the extraction of honey last season. During the winter months, damp and mildew within the hive, cracks in the walls thereof admitting cold draughts, enemies that have been overlooked when the bees were put up for the winter, and many other causes may have weakened the colonies. During the warmer part of the days in the past winter, or more especially as the spring advanced, dead bees were to be seen on the alighting-board. The mortality among bees is due chiefly, but not wholly, to the causes above referred to. If it were possible to keep a record of vital statistics of bees, old age and starvation would show the highest score on the death-roll.

Along the coast districts spring forage is now becoming plentiful, and increasing in quantity as we go northwards. On the higher tablelands, and especially down south, frost and snow, still prevailing, will retard spring operations considerably. In our warmer districts there will be, more or less, young brood in the hives, if the queens are up to the required standard, but not so in the colder areas, where, outside the hives, deaths will be more numerous, and the stocks will be correspondingly weaker.

If forage be scarce the bees should be fed sparingly so as to stimulate the early feeding of brood. Pure honey is by far the best. There are substitutes. But with pollen it is another matter. For this necessary article of diet bees do not confine themselves solely to the dust of flowers. In the cold district of Monaro I have known them to revel in horse-feed composed of a mixture of bran left in the feed-box, and go home laden with the dust thereof. This, to my mind, was evidence that there was plenty of honey in the hive, but a scarcity of pollen wherewith to prepare bee bread for the coming brood.

There are many artificial substitutes for pollen—rice flower, oatmeal, and pea flour are amongst the best of them. There is not the slightest danger to the bees in giving them a fairly good supply during warm, bright days. Place it in easy access. It must be taken indoors before sundown every day, and not put out in the mornings until all dampness is gone. At no time should artificial pollen be permitted to become damp; it is sure to get mildewed. If used in a mildewed state it will produce dysentry. Treacle must not be used as a substitute for honey, nor wheat flower for pollen. They act as a purgative and thereby weaken the young brood.

If, during the winter months, all frames have not been made and foundation comb has not been fixed, no time should be lost in doing this necessary work. As the season advances, time will become more precious for other work in the apiary. See that all empty hives are clean and free from the larvæ of the bee-moth. Empty combs that were stored in the autumn a few days before using with sulphur smoke. It is a good thing to fumigate empty combs two or three times during winter months. If the stocks appear to be numerically weak, strengthen them by uniting two or more colonies. At this season of the year no colony will have sufficient brood comb to admit of a weak colony being built up therefrom, but later in the season it can be done. If it is desired to largely increase the number of stocks, have placed in position all the empty hives you contemplate filling. Paint the outsides of all hives, and see that they are so placed that the frames will hang perfectly plumb.

Towards the end of the month, in the warmer districts, queen cells will be making an appearance. These should be cut out if it is desired to check early swarming. Nevertheless, it is the early swarms that are the most valuable. Nucleus hives should be prepared for queen rearing—that is, if re-queening to any extent be contemplated. But queens are so cheap nowadays that it will be found cheaper and better to purchase them from some accredited dealer.

PEA NUTS OR EARTH NUTS FOR POULTRY.

IN most of the coastal districts it is comparatively easy to obtain good crops of these "nuts." For poultry, according to an American authority, pea nuts are a food that can scarcely be excelled. In the experience of the authority quoted, they are far more satisfactory than maize, wheat, or oats for laying hens, as well as for growing chicks. Hens and chicks do not get so fat on them as upon grain. As a dainty to throw into the feeding yards, a few plants, nuts and all, come in very handy.

Farm Notes.

NORTHERN RIVERS.—September.

H. V. JACKSON.

Those who have grown cereal crops for hay, will probably have some sufficiently forward to harvest the crops. The weather will require to be watched for favourable opportunities to get the hay properly cured.

The planting of arrowroot bulbs should by this time have been completed.

Some of the potato plots should be making good headway, and further planting may be done.

Peas should be abundant at the present time. Pull the pea pods as they attain a good size; if allowed to ripen the seeds, they will soon cease to bear.

Sowings of maize may be made. Golden King, Hawkesbury Champion, and Red Hogan, have given good results here, also Anderson's Red Nibbed maize. One of the best specimens of maize I have seen was grown by Mr. John Ball, of Gundarimba. The variety was, I believe, named Manzey's maize. Mr. Ball has been good enough to send me sufficient of this maize to make a sowing at this farm for trial.

Sorghum and millet should be sown. The Early Amber cane appears to be most relished by stock.

When ploughing land for such root crops as mangolds, swedes, and turnips, the soil should be worked in such a manner as to form a fine tilth of good depth, and to leave a clean seed bed. The land should be deeply ploughed for mangolds, and where the subsoil is dense, the use of a subsoil plough will be of advantage, especially preparatory to planting the Long Red mangold. Mangolds may be sown either on ridges or on the flat. The ridge or hill system is followed on wet, heavy land, but on the friable soil at Wollongbar I have always sown on the flat. The seed of mangel is drilled in rows of 3 feet 6 inches or 4 feet apart, the plants being thinned out later to 12 inches or 18 inches apart in the rows.

Cattle melons should be sown, also pumpkins squashes, grammas, and preserving melons.

Pea-nuts should be sown. They grow to perfection in this climate, and are an excellent addition to the rations given to pigs.

Buck-wheat may be sown, either for green feed or for grain. It is excellent food for poultry. Cow peas may also be sown, either for ploughing in or for green feed.

Sunflower should not be forgotten at this time. It grows rapidly and the seed is much relished by poultry. It should be sown in drills 3 or 4 feet apart.

Grass seed, clover, and lucerne may be sown.

Keep the soil stirred up among the vegetables, for the dry westerly winds blowing after rain, make the ground hard on the surface. Some liquid manure will help vegetables that are not doing well.

Red beetroot, if coming up too thick in the rows, should be thinned out.

Spray fruit-trees with Bordeaux mixture, and sulphur the grape-vines. Tie up the tender shoots of the grape-vines, and remove all suckers as they appear. Look over the fruit-trees frequently for borers. Spray with resin and soda mixture for scale insects on fruit-trees.

In the flower garden, bouvardias should be pruned back. Rose-bushes should be gone over, and the shoots thinned out. Cannas may be divided up and replanted. Azaleas should now be making a bright display—they grow exceedingly well, and it is surprising they are not more extensively grown. Dahlias may now be planted out, and Chrysanthemum clumps may be divided up and planted out.

RIVERINA NOTES.—September.

G. M. McKEOWN.

Potatoes.

Planting should be completed as early as possible, the earliest varieties being selected for this month's operations. Flat cultivation will be found the best in these parts, as it renders more practicable the cultivation necessary to retain moisture.

Pumpkins and Squashes

May be sown as soon as danger of frost is past.

The ground should be deeply worked, brought into fine tilth and well manured. The practice of sowing the seed in raised mounds is in dry districts inadvisable, sowing "on the flat" being preferable.

For field culture, King of the Mammoths and Mammoth Toms will be found good varieties.

The following varieties for table will be found the most successful, viz.:—Early Orange Sugar Pumpkin, Delicata, Fordhook, and Custard Squashes, and Long Green and Long White Bush Marrows.

Melons

Should be sown towards the end of the month in well prepared land which has been well manured. Some protection should be provided against late frosts.

The following varieties will be found among the best, viz.:—Wonderful Sugar, Kleckley, Dixie, and Cuban Queen. Of rock-melons the most successful kinds are:—Cassaba, Netted Gem, Hackensack, and Montreal. Cattle melons should also be sown.

Cow-peas

Should be sown when risk of frost is past. For seed production, the best method of sowing is that of drilling in rows 3 feet apart to admit of cultivation while the crop is growing.

For a crop to be ploughed in or fed off, the seed may be sown broadcast. 20 lb. of seed will sow an acre in drills; 50 to 60 lb. will be required if broadcasted.

Maize

May be sown in deep alluvial soils for green fodder or ensilage.

Seed should always be sown in drills 3 feet apart to admit of proper cultivation.

Vegetables.

Sow beans of dwarf and running varieties.

Transplant cabbages, the best summer kinds being St. John's Day and Dwarf Drumhead.

Sow tomatoes, and transplant any which may be available from previous sowings. Shelter from late frosts should be provided.

HAWKESBURY DISTRICT.—SEPTEMBER.

GEORGE VALDER.

Maize.

Up till the past few weeks little had been done towards preparing land for the maize crops, but every advantage has been taken of the fine weather, and a fairly large area has been prepared. The season so far is very promising, and the early crops should get a good start. Generally, the early-sown crops give the best results, as during the moist spring weather the seed germinates quickly, and the plants make a rapid growth, obtaining a good hold of the soil before the hot weather sets in. For early crops it seems that ordinary ploughing to a depth of about 6 inches is quite sufficient, as in the cool weather the plants send out the greater portion of their roots into the surface soil, and only commence deep-rooting on the approach of hot, dry weather. On the other hand, the late crops should be ploughed deeply, as it is advisable to encourage the plants to root deeply right from the start; this is especially necessary in districts subject to drought. On the lighter soils the "listing" system of planting can be strongly recommended, *i.e.*, sowing the seed in the bottom of the furrow; the true "listing" system is simply ploughing furrows the width apart that you intend to place your drills, and not ploughing the rest of the land, simply working with cultivators after the plants are above the ground. On farms where it is intended to plant several varieties, the slow-maturing varieties should be planted first, and the quick-growing varieties last. Hawkesbury Champion, Golden King, and others of the Yellow Hogan type seem to be holding their own in this district, having given some remarkably good yields the past season. Early Mastodon also gave a splendid return in most instances, but it can hardly be called "early," as it is a very slow-growing variety with us. Ninety-day, Queen of the Prairies, and some of the quick-growing American varieties recently imported by the Department should be suitable for late sowing.

Maize for Green Fodder and Ensilage.—Sowing should commence this month in order to obtain early supply of green fodder for the dairy cattle, and also to, if possible, get a small ensilage stack or pit ready, so that some silage will be ready in case of a severe winter. Cereals for larger pits or stacks can be put in later on. Drilled maize is much superior to broadcast either for green fodder or for ensilage. For ensilage, maize should be planted nearly if not quite as wide apart as when grown for the grain. Closer planting, it is true, sometimes gives a greater yield of green fodder, but it is now generally recognised that its feeding value is much increased by allowing the cob to be well formed before cutting, the best time being when it reaches what is termed the glazing period, *i.e.*, when the grain is fairly firm and the skin glazed.

Sorghum.

Early sowing of this crop should be made this month. Like maize, the drilled crop is far superior to the broadcast. The ordinary maize drills, such as the "Farmer's Friend," are very suitable for sowing sorghum, and with the drills at 3 feet apart will sow 4 to 6 lb. of seed to the acre, and the plants will then be quite close enough. Early amber cane yields a very heavy crop, and in feeding trials last season the cows gave better results with this than with any other variety, eating it more readily, and milking better on it. The non-saccharine sorghums, such as Kaffir corn, are not relished nearly as well, and will not compare with amber cane for milk yield.

Millet.

Sowings of Hungarian Millet should be made this month. Being a quick-growing crop, it forms a very useful early green fodder, coming in much earlier than maize or sorghum. If there is a good supply of green fodders the crop can be left for a while and cut for hay, taking care, however, whether cutting for green food or for hay, that the ears have not turned yellow, as at this stage the little awns with which the ears are covered will often have an irritating effect upon the intestines of the animals eating it.

On farms where sheep are kept it is a good plan, in favourable seasons, to graze off the crop when it is about 8 of 9 inches high. Hungarian Millet stands the feeding and tramping well, and will generally make a strong second growth, and in some seasons can be fed off two or three times.

Mangolds and Sugar Beet.

Mangolds and sugar beet, if not already sown, should be put in at once, the early-sown crop being almost always the best. In the coastal districts, sowing on ridges is to be recommended. In nearly all moist climates the ridge system is the best for root crops. During the past season heavy crops of these roots were obtained at many places on the coast, and they proved exceeding valuable to the dairy farmers, &c. Being easily stored, they are available right through the winter, and therefore when green fodder runs out can be fed with chaff to great advantage.

Regarding the best variety of mangold, much depends upon the soil. On shallow soils the Globe or Tankard variety do best, Yellow Globe being generally the favourite. For strong deep soil the Mammoth Long Red is the best.

Potatoes.

Potatoes, like mangolds and beet, are best put in either in August or early this month. For this crop the soil requires to be in a high state of fertility in order to obtain the best results. Direct application of fertilisers is very uncertain, except in soils well worn by previous cropping. The best crops are obtained either when planted on land that has been heavily manured for the previous crop, or when following a leguminous crop. The potato crop in most districts is suffering more and more from disease. Much of this is due to planting affected tubers. None but perfectly sound ones should be used, and if there is any sign of disease among them they should be treated before planting. I notice that, according to the results of some experiments carried out in the U.S. Experimental Station, for wet rot, heating the tubers to a temperature of 105° for four to six hours has a very beneficial effect. Spraying with Bordeaux mixture is also a good remedy for the same disease.

A potato affected with scab.

Sweet Potatoes.

Tubers should be placed in the seed-bed this month, choosing a warm corner, so that they will sprout quickly and produce cuttings for early planting. On light sandy soils they prove a most valuable crop for the coast, often bringing high prices and being valuable for feeding to stock.

Jerusalem Artichokes

can also be planted this month. In many soils they yield a very heavy crop of tubers, which are valuable for feeding to milch cows and pigs. Turning pigs in on the crops also has a beneficial effect upon many poor rough soils.

Pumpkins and Melons.

Water-melons should receive some attention this month, as much depends upon getting them into the market early. Pumpkins, squashes, grammas, and preserving melons for feed should be planted. These are all useful for stock, &c. Pumpkins, when cut up or put through the root pulper, form a capital feed for dairy cows, and are at all times most useful for sheep, pigs, &c.

For manure, our Chemist (Mr. Guthrie) recommends the following mixture:—

500 lb. dried blood,
470 lb. superphosphate,
150 lb. sulphate of potash,

making 10 cwt. Applied at rate of 4 to 4½ cwt. per acre will be a satisfactory dressing, and cost from 26s. to 30s. per acre. On fairly rich soils a lighter dressing, say, 2 cwt. to the acre, would be sufficient.

Preserving melons generally yield very heavily in this district. There is often a market for them, and when prices are too low, they can be utilised for feeding to stock. Pulped or sliced, and mixed with chaff and bran, they form a good food for milch cattle.

Leguminous Crops.

Cow-peas, Lima-beans, Soy-beans, and other leguminous crops suitable for the warm season should be sown at the end of this month.

Lucerne can still be sown, and as the soil has been thoroughly saturated, it should make a rapid growth.

Pea-nuts should receive some attention. In the United States where they are largely grown, they have proved one of the cheapest and best foods for fattening pigs.

Small Crops.

Small crops, such as buckwheat for bees and poultry; sunflowers for bees, poultry, and fodder; chicory, &c., can now be sown.

Orchard Notes.

W. J. ALLEN.

SEPTEMBER.

DURING this month the orchardist will be kept pretty busy getting his land into good condition. Not only will the ploughing require to be completed, but the trees will all require to have the earth about them well loosened up with the fork-hoe and brought to a fine tilth. Except in those districts where rain can be depended upon for a certainty, ploughing after this month should never be practised, and during the hot months all that is required is to keep the orchard well stirred with a good small-tooth cultivator. This latter should receive the fruit-grower's careful attention, and should the district be favoured with an occasional shower, start the cultivator going immediately the land is dry enough to work.

The fate of the coming crop depends largely on the attention bestowed on the cultivation, and it is most important to see that this is not neglected in any detail, as it is absurd for growers to think that they can continue fruit-growing without not only good cultivation, but, coupled with it, judicious manuring and systematic spraying, to keep in check the various insect and fungus pests.

This month is about the best time to apply quickly dissolving manures to the orchard and vineyard, such as sulphate of ammonia, nitrate of soda, sulphate of potash, &c.

Planting of citrus trees should also be proceeded with as early as possible this month, such planting having this advantage—that as soon as the tree is planted it should commence to grow immediately; and this I consider a much better plan than removing a tree during the cold winter months, when after planting out they are subject to cold winds and often frosts, the latter being often responsible for the death of the early planted trees in those districts where frosts are common. Further, it has been proved by experiments, that there is always a certain amount of evaporation going on from a tree during the summer and winter, and as this evaporation must weaken to a certain extent the tree which has no direct source of supply; therefore, where fall planting is to be carried out, plant early, so that the roots may become established, or plant in the spring just before the growing season, or just after the first growth. Of course, where irrigation is not practised, the early spring planting must be practised; but the winter moving of citrus trees is very apt to terminate in loss or injury to the tree so moved.

All fruit-trees and vines should have had their winter spraying completed by the first of this month. Black aphis is still doing much damage to the peach and nectarine trees principally, and should receive careful attention. As soon as the petals have fallen, all pear and apple trees should receive a thorough spraying with Bordeaux mixture (summer strength), and to each 12 gallons add 1oz. of Paris green. I regret to say that the application of Paris green has not, so far as I can ascertain, given as good results here as are claimed for it in America, where it is stated that two sprayings have saved as many as 75 per cent. of the apple crop from this pest. From experiments which I have carried on, the results have not been nearly so good; still the apple growers cannot afford to neglect either this spraying—which should be followed by another in a fortnight after the first—or the bandaging, the latter being very important if properly conducted.

There is no doubt that store rooms where the fruit is kept are largely responsible for the secretion and harbouring of a great number of moths, these should, therefore, be made as tight as possible, so that when the grubs hatch out in the spring they may be destroyed. I have seen hundreds of cocoons in a single fruit room, and have caught the moths at the windows in the early spring in the same room; and therefore I say the grower cannot expect a clean orchard so long as he protects the moths in his buildings.

In districts where Maori has been prevalent, the young oranges should be sprayed with soft soap and sulphur when they are about the size of a marble. This remedy is prepared as follows:—Boil 1 lb. of sulphur and 2 quarts of water for ten minutes, then add 3 lb. of soft soap to the mixture and dissolve this, and add sufficient moisture to bring the whole up to 4 gallons. Use a fine spray for applying this solution.

Trees will commence to grow this month, and towards the latter end it may be found advisable to go over them and rub off all the young growth which is not needed to make the crown of the tree, leaving buds starting from different points around the barrel of the tree where it is desired that the limbs should start from which are to form the crown. Never allow two to start from the same place, keeping them at least 4 inches apart radiating round the tree. Citrus trees may be pruned this month.

Grafting of nursery stock trees and vines may be carried out this month. Vines are best grafted just as the buds are about to burst, and after the grafting of deciduous trees has been completed.

For the red spider, which is gaining ground in many of the fruit-growing districts (especially in three dry districts), and which attacks the apple, plum, peach, and pear, the following spray is said to be one of the best now in use in California, to be applied when the eggs have hatched:—

10 lb. caustic soda (Greenbank's 98°)
20 lb. sulphur
20 gallons water.

To mix the above thoroughly, put the sulphur in a barrel and add sufficient cold water to mix to a paste; then add the caustic soda, which will cause it to boil, but see that it is sufficiently thin not to burn. If ordinary caustic soda (70 per cent. strength) is used, add ¼ more, and the mixture will need to be boiled in an iron pot or cauldron. Then add the remainder of the 20 gallons of water, and the stock solution is made. Add a half gallon of this stock solution to 40 gallons of water.

Experiments for the destruction of this pest have been carried on at our Government orchards with a view to destroying the eggs in winter before they were hatched; but, so far, we have not been successful in finding a solution which will destroy all of them. The ordinary winter spraying of salt, sulphur, and lime will destroy a certain percentage.

A COTTON-PICKING MACHINE.

MR. W. J. DYER, of Shreveport, La., U.S.A., has invented a new machine for picking cotton, which is described by the *Boston Journal of Commerce* as ensuring a clean and thorough removal of the bolls from high or low cotton bushes or plants, without tearing the fibres of the lint or the growing plant. The machine comprises a horse-drawn, wheel-supported box, at the sides of the open front end of which vertical shafts are journaled, carrying picking discs. Each picking disc is formed with a solid core, the top and bottom of which diverge from the edge to the centre. Between these picker shafts two other vertical shafts are journaled, provided with brushes bevelled at top and bottom to conform with the toothed picking discs. On the lower ends of these four vertical shafts bevelled pinions are carried, which mesh with bevelled gears on a forward transverse shaft geared with the traction axle. The bevelled gears are so proportioned to the pinions that the picker shafts will rotate at a lower rate of speed than the brush shafts.

As the machine is drawn forward, the outer sides of the picking discs pass between adjacent branches of the brushes, and the teeth remove the lint from the bolls. The cotton lint thus picked is carried inward as the picker shafts rotate, and swept off the discs by the brushes into the box,

In order to prevent the lint from flying sideways and outward from the brushes and pickers, and to prevent clogging of the brushes and pickers by the lint, angularly disposed canvas flanges are arranged on the forward ends of the sides of the box, which flanges are provided with cut-out portions for the passage of the picking discs.—*The Textile Mercury.*

Practical Vegetable and Flower Growing

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF SEPTEMBER.

Vegetables.

THIS is the time of year when a great variety of vegetables may be sown in all localities throughout the Colony, except in the coldest districts; but even in these places preparations can be made both for sowing and planting such tender varieties of vegetables as will succeed.

In all the warmer parts, a good sowing may be made of Kidney beans, including those known as scarlet runners. Lima beans, of both the dwarf or bush and runner kinds, may be sown. Of the Kidney or French beans there are many varieties, both dwarf and runners, the differences in flavour and qualities being considerable. The butter beans, or those without "strings," are good, and should be tried. The snake bean is worth a trial, being very prolific and having a very decided flavour of its own. These beans should be gathered for use whilst they are very young; and, indeed, all beans should be used whilst they are tender. The snake bean is a runner; so that provision should be made for this by any intending grower. Of the dwarf varieties of French beans, the Canadian Wonder is, so far as this Colony is concerned, perhaps the best yet introduced. It is an exceedingly heavy cropper, and the beans are good. Pale Dun and Governor Denison are both good. A dwarf stringless variety named Burpees New Stringless Green-pod should be worth a trial. This has not been in the Colony very long.

The Lima beans should always be grown—both the dwarf and runner varieties. The plants are wonderfully prolific, and if the pods are all gathered before they ripen, will continue to produce for months after the first start. The bean is used in cooking in the same way as the broad-bean.

Now is the time to start sowing all sorts of melons, cucumbers, vegetable marrows, squashes, and gourds. When preparing land for such vegetables, use plenty of farmyard manure—not merely in holes where the seeds are to be planted, as is the usual custom, but all over the beds. Dig it well in, and mix with the soil.

Asparagus.—May be planted early in the month, except in the coldest districts, where the work may be delayed for another month or so if desired, or so long as the plants in the seed-bed have not started nto growth. If it be desired to raise plants from seed, the seed may be sown now, and the sooner the better. One of the most reliable varieties, or so-called variety, is Connova's Colossal.

Asparagus Pea (Lotus Tetragonolobos).—A new vegetable has been catalogued lately as a novelty. Its merits as a vegetable are not known to the writer, but the plant was grown by him upwards of thirty years ago as an ornamental annual in the flower garden. It may be worth a trial as a vegetable.

Bean, French or Kidney.—Sow a supply, and when the plants appear above ground sow a few more in order to keep a supply going. Sow in drills about 2 feet 6 inches apart for the dwarfs, and about 3 to 4 feet apart or more for the runners. The seeds should be sown about 4 inches deep and about 5 inches apart. If artificial manures are necessary, use superphosphate of lime and potash, or fine bone-meal. Any lime, lime-rubbish, or gypsum available might be applied with advantage.

Bean, Lima.—Sow only in warm localities, and of either the bush or runner varieties.

Beet, Red.—Sow seed in drills about 18 inches apart and about 1 inch deep.

Beet, Silver.—This useful summer vegetable should always be grown. Sow seed in drills, or in a seed-bed, whence the young beets can be taken for planting in a well-manured bed.

Cabbage.—Sow a little seed in a seed-bed. Plant out any good young plants that are ready. Cultivate well between growing plants which are making headway.

Use abundance of farmyard manure from the garbage heap, and do not be afraid to over-feed the cabbage.

Cauliflower.—In the cool districts, plant out from the seed-bed. Use manure most liberally, and do not let the plants suffer any check whatever, or else they are liable to "button,"—that is, to form small, insignificant heads.

Carrots.—Sow a few rows of varieties, both short, medium, and long-horn. The short and medium are generally the best flavoured. Sow in drills 1 foot to 18 inches apart.

Celery.—Sow a little seed in a small seed-bed or box for future planting out. Any plants available which are sufficiently large may be planted out in trenches. The celery needs heavy manuring, and a good deal of moisture. Advanced plants should be earthed up, as they are likely to be required.

Choco.—The fruits which are somewhat like small vegetable marrows in appearance, may be planted in warm localities. The vines can be trained over supports such as fence or wall, or they will trail over the ground, but they grow all the better for supports. This is a prolific vegetable and well appreciated by some persons.

Cucumber.—Sow seed. or plant out young cucumbers which have been raised for the purpose, but be careful in cool districts to protect the plants at night from frosts.

Endive.—Sow seed in places where frosts are not likely to occur. When the seedlings are large enough to handle, plant them out in rows 15 inches apart and 1 foot from plant to plant in the rows. Manure well. When the plants are nearly full size, tie up the outside leaves together in order to blanch the inside leaves or hearts.

Leek.—Sow a little seed. Plant out from seed-bed any plants which have already been raised for the purpose. The leek needs heavy manuring, and may be improved by watering with liquid manure as frequently as is practicable.

Lettuce.—Sow a little seed and plant out from the seed-bed. Do not "draw" the young lettuces from the seed bed, but raise them with sufficient care to prevent breakage of their roots. Towards the end of the month, and especially so in the warm localities, sow lettuce-seed in rows where the plants are to stand and mature; for transplanting lettuces, in the warm weather, are liable to run to seed, or "bolt," quicker than those grown straight on from seed. Manure well, and apply liquid manure occasionally.

Melon, Rock and Water.—Sow in all the warm localities as advised for cucumbers.

Okra, or Gumbo.—Sow in a seed-bed, and afterwards transplant the seedlings, when they are large enough, 2 feet apart on well-manured land.

Onions.—The land for onions should be well manured, and the surface soil should be made as fine as possible. Then seed may be sown in drills, but the drills should be very shallow and the seed very lightly covered with soil. When onions have been raised in a seed-bed for transplanting, they may be moved as soon as possible and planted out.

Parsnip.—Sow a few rows. This vegetable needs a deep preparation of the soil prior to sowing the seed.

Peas.—A few rows should be sown, and the advancing plants should be sticked before they grow large.

Pepper or Capsicum.—Sow a little seed in a seed-bed for planting out later on.

Potato.—Plant medium-sized clean potatoes, free from scab and potato moth, in well-manured land in rows about 2 feet 6 inches apart or 3 feet, at a depth in the soil of 6 to 7 inches. The potatoes should be about 1 foot apart in the rows. When they come up, cultivate well, but do not draw and heap up the soil about their stems.

Pumpkins.—Sow seed in well-manured land.

Rhubarb.—Seed may be sown if plants are required to be raised. Mr. Dunnicliff's success at the Bathurst Experimental Farm with rhubarb raised from seed has been marvellous, for he has been able to gather leaves from his plants which were but nine months old, from the seed. Specimens of these plants were shown at the Royal Agricultural Society's Show in Sydney last April.

Tomato.—Sow seeds in the open ground in all the warm localities, or transplant from seed-bed.

Turnip.—Sow a few rows in drills, about 18 inches apart, in well-manured ground.

Vegetable Marrow and Squash.—Sow seed in all warm localities.

Flowers.

Very soon, in nearly all localities in the Colony, there should be a great display of flowers of many kinds. The rose plants should be making vigorous growth, but very frequently they produce their wood too abundantly; therefore, it is advisable for the grower to thin out, as soon as he can do so, all unnecessary shoots which are likely to draw away the nourishment from those shoots which should be retained for keeping the plants symmetrical and to bear flowers.

Should any suckers appear from the ground about the stems of the roses, remove them at once. To do this, draw away the soil and break them away from the roots or lower parts of the stems from where they have started to grow.

If farm-yard manure can be spared in sufficient quantity, spread a thick mulch all over the garden, and do not be afraid that it will injure any plants, for it will not do so.

When personally advising such a practice, I am frequently informed that the fresh manure will kill the plants. This is not the case, however, as I know from the personal experience of many years. I may state here, once for all, that many of the recommendations in these directions may not be in accordance with general ideas, but they are offered as the results of the long experience of actual personal practice, under all sorts of conditions.

Anyone who may not have planted bouvardias yet had better do so as soon as possible; and should the weather be dry at time of planting, a good soaking of water should be given after the planting.

Sow all sorts of tender and half-winter annuals, either in boxes or pots for transplanting or in the garden. Those which have long tap roots had better be sown in the places where they are to flower. The others had better be raised as above.

General Notes.

PREVENTING BUSH-FIRES.

THE Commission appointed in Victoria to consider the best measures to adopt to prevent the recurrence of the disastrous bush-fires that have, during the past few years, wrought such havoc in some of the best agricultural districts of the Colony, have concluded their labours. In the report submitted, the Commission draw attention to the necessity for more stringent legislation, such as exists in the other Colonies, against the careless use of fire in grassed and timbered country, and make the following recommendations :—

That the police and all forest officers and Crown land bailiffs be appointed fire wardens. Where there are no such officers suitable persons be selected for the work. That it be the duty of the fire wardens to prevent as far as possible the commission of offences against the law, and to take prompt steps for the extinction of all forest or grass fires. During the months of November, December, January, February, and March the following precautions shall be taken :—

Fire-breaks.—The making and maintaining of effective fire-breaks not less than half a chain in width (a) by all owners or occupiers of grass land within and along the boundary fences of such land in their respective holdings, except owners or occupiers of such land situated in forest scrub districts. This provision to apply to all grass land having an area of 50 acres and upwards, and also to grass land having a less area than 50 acres when, in the opinion of the local fire warden, the making of such breaks is necessary for the protection of adjacent land from danger of fire.

Camp Fires.—The selection by the local fire wardens on the principal public roads or water reserves of the Colony of suitable camping places for travellers. The spot for lighting fires at such camping places to be, where practicable, in the dry bed or channel of some creek, or on the edge of some running stream, lake, lagoon, dam, or other body of water, and no fire to be kindled thereat at any standing tree, stump, fallen trunk of a tree, limb, or large log, but to be kindled and fed with small wood only, and to be completely quenched or extinguished by such travellers before leaving such camping places. Where no such camping place is set aside and indicated by public notice posted in the immediate neighbourhood thereof, every traveller in choosing a place to camp to select a clear space, having a radius of at least 10 feet, or to make a clear space having such radius, to kindle and feed a fire thereon, when such is required by him, with small wood only, and before leaving such camping place to completely quench or extinguish the fire thereon.

Shooting and Smoking.—That the following acts be forbidden during the months of November, December, January, February, and March :—The use of any ignitable or combustile wads or wadding in any gun, rifle, pistol, or other firearm ; the blasting of trees, wood, or timber with any explosives, unless at least two persons are present to prevent the spread of any fire arising therefrom ; the burning of trees, live or dead timber, scrub, or undergrowth, for the purpose of clearing land, except in such districts as may be proclaimed by the Governor in Council as forest scrub districts ; the burning of stubble, dry grass, or other herbage, except for the sole purpose of making such fire-breaks as are provided for by law ; the lighting or smoking of any pipe, cigar, or cigarette in the open air within 20 yards of any standing crop or field of hay, corn, straw, stubble, or other inflammable vegetable production ; the throwing down or dropping of any lighted or unlighted match, or lighted tobacco-pipe ashes, cigar, cigarette, or other burning substance, unless the fire of such be at once extinguished on the spot. That the following acts be forbidden :—The lighting or smoking of any pipe, cigar, or cigarette in or within 20 yards of any stable, or within the same distance of any rick or stack of hay, corn, straw, or other inflammable vegetable material ; the placing, throwing, or dropping of any inflammable, combustible, explosive, lighted, or burning matter or substance, for the purpose of causing a fire with intent to damage person or property ; the burning of grass, stubble, herbage, timber, or scrub on a Sunday for the purpose of clearing the same.

Burning Off.—That the Governor in Council have power to proclaim certain districts as forest scrub districts, and to repeal, alter, or amend such proclamation when, owing to the clear and open character of the land in any such district, or any portion thereof, it ceases to be properly classed as such. That no district be proclaimed a forest scrub district unless—(1) The land, occupied therein by settlers, is covered or partly covered with live or dead timber and thick scrub or forest undergrowth; and (2) unless, owing to the lateness of the rainy season or general humidity of the climate in such district, the grass and other herbage is green and succulent during the months of November, December, January, February, and March, and the timber, scrub, or undergrowth can be effectively burnt by settlers in the course of clearing their land only during such months. That no person shall during the months of November, December, January, February, and March set fire to any timber, scrub, or other inflammable matter on any private land or land held under license or lease from the Crown in a forest scrub district for the purpose of clearing the same:—(a) While a hot northerly wind is blowing; (b) between the hours of 4 o'clock in the forenoon and 6 o'clock in the afternoon; (c) unless there shall have been cleared around the inside of the boundaries of such land of scrub, grass, or other inflammable herbage, a space not less than half a chain in width; (d) unless he shall have given to the local fire warden and also to the owners or occupiers of all lands adjacent to the land on which he intends to burn timber, scrub, or other inflammable matter, at least forty-eight hours' notice. Should the burning of such timber, scrub, or other inflammable matter be regarded by the local fire warden as dangerous, owing to its situation with respect to inflammable matter on adjacent public or private lands, or owing to the state of the weather, the warden to have power to order the postponement of such burning until such time as in his opinion it can be undertaken with safety. Should there be any tract of dry or inflammable grass or herbage within a forest scrub district, which, in the opinion of the local fire warden, is a source of danger to adjacent public or private lands, the warden to have power to call upon the owner or occupier thereof to make an effective fire-break around the boundaries of such tract in the same way as if it were outside the limits of a forest scrub district.

Municipal Liability.—That the cost of extinguishing fires, including the payment of any remuneration or allowance to such fire wardens as are not regularly employed in the service of the State, and also to such persons as are called upon by wardens to give aid in extinguishing fires, be borne in equal shares by the Treasurer of the Colony and the municipality in which any such fire warden resides and any such fires may occur.

BLUESTONE FOR WHEAT.

MR. JOHN BROADHEAD, of Inverary Park, mentions that in the description of his method of bluestoning wheat (*Agricultural Gazette* for July, page 609), the quantity of water in the cask should read 17, not 14, as printed. In addition to these 17 gallons there are two gallons of boiling water used to melt the bluestone in, so that the total quantity of water is 19 gallons.

TURKEY FARMING.

PEOPLE who would make a beginning at turkey farming will find the present a suitable and seasonable time. If resolving to get up a flock, they must buy turkeys' eggs and rear their own stock birds; or they may buy half a dozen or more hen turkeys and a turkey cock, and begin at once to set all the eggs they will lay, with an eye to getting into the market the first season. Except to beginners who have money to throw away, or those who know a good deal about the business of rearing, the best advice will be to start low, and to be sure they have secured the right paying breed before launching out. There will be the question of securing suitable premises also to consider. Turkeys like a good range. They will do very well in a fair-sized paddock during the rearing season, but as soon as they get beyond the coddling stage they should have plenty of ground to roam over and as great a variety of natural food as possible. Plenty of exercise and a beautiful natural feeding-ground mean fine, cheaply-reared birds. Limited runs mean more cost in foodstuff and slower growth.

One of the mistakes most beginners at turkey-rearing make is that of not providing an ample supply of green food beforehand. The newly-hatched turkey chicks are most delicate in constitution. They chill with the least exposure, and they mope and droop off before one knows, almost, what ails them. The most natural fortifier in the way of food is that of highly-flavoured warmth-giving greenstuff. Quite a third of what they eat at every meal should be from the garden. Young green onions, green mustard and land cress *(Barbarea vulgaris)*, or the American cress, as it is called, are most valuable on this account. Nettles, for a similar reason, are good. Dandelion leaves come next in value, and after those, such things as cress and watercress. As great a necessity is that of supplying in the feeds sufficient sharp, hard grit to keep the crops of the little birds active. In addition to what most people call these extras there should be fresh, sweet milk.

The first feed should be yolk of hard-boiled egg, chopped fine, shells and all, greenstuff, biscuit meal or toasted brown bread, grated fine, and a little rice meal, with grit, all just moistened to crumbliness with warm new milk. I always put a two-days-old chicken with the newly-hatched turkeys, to set them an example in learning to feed. After a peck or two they should be put back under the hen, in a warm, roomy coop. Every hour or so for the next twelve they should be again tempted to feed, and in the 'tween whiles they should be kept under the hen. From that time on for two or three weeks the attention must be as close, excepting that the feeding times may gradually widen apart, and at every possible moment the coop and run should be where the birds can have the full benefit of the warm sun and air. After then the hen may be allowed a little more freedom with her brood. The food may by this time have varied in the matter of giving less of egg food, and of gradually substituting for it curds, coarse oatmeal, and small rice. A large lath-fronted coop with a lath-sided covered run will now be needed. The floor board should be made so that it can be either drawn out or the coop be lifted off. It can then be swept clean daily, and dusted with peat dust or dry ashes.

From now on till the birds begin to show the red they will need constant watching, regular feeding, and tending. The hen may be allowed to range with them whenever the weather is fine. Care must be taken that she does not lead them into the long wet grass in the early mornings, and they must be shut in before the evening dews fall, and always during wet weather. A dust bath under cover, careful disinfecting, and always fresh clean drinking water are all essentials in successful turkey-rearing.—T. BARRON, in the *Agricultural Gazette*, England.

THE SOY BEAN AS A FORAGE CROP.

SOME years ago Mr. Geo. Valder, who was then manager of the Wagga Experiment Farm, conducted a number of experiments to determine the value of the Soy (or Soja) bean for culinary and fodder purposes. The opinion formed on the trials was that for a hot-weather grower it was hard to excel the Soy bean, which produced an abundance of foliage and pulse. Seed was also sent to farmers in various parts of the Colony, and in one place—Rylstone—this bean produced a wonderful crop during the hottest and driest months of the year.

In the States, where pulse crops for forage receive a great deal more attention than is the case here, the Soy bean is recognised as a valuable and reliable crop for seasons of drought. Speaking of it in the *American Agriculturist*, Professor Thomas Shaw, of Minnesota, which is just as subject to prolonged spells of hot, dry weather as our western districts, says:—

> The Soy bean may be grown for the grain, for soiling food, for ensilage, for pasture, and for green manuring. Its greatest value, however, will probably be found in furnishing soiling food for dairy cows, as it is in the proper condition for being thus fed at that season of the year when but few plants are available for such a use; that is to say, during the latter part of the summer. The Soy bean is a hot-weather plant, and is able to stand more drought than the cow-pea. When once well-rooted, hot winds that would wilt and wither many other forms of vegetation will not seriously injure the Soy bean.
>
> In appearance it resembles a common bean, but the foliage is larger and much more luxuriant, and the habit of growth is more upright. With all the conditions favourable, this plant in some of its varieties will grow to the height of at least 4 feet, and it produces a large yield of green food. Some of the early varieties, as the medium or green, can be grown successfully further north than the cow-pea. The claim, however, that they will flourish as far north as corn is not quite correct. And since it will stand drought better than the cow-pea, it has special adaptation for districts subject to scanty rainfall. Its province as a catch crop is more circumscribed than that of the cow-pea, since in many of its varieties it takes longer to mature. Nevertheless, there are many crops which it may be made to follow the same season, as, for instance, winter rye, winter wheat, grain forage eaten down, or an early crop of potatoes. A warm, rich vegetable soil with a porous subsoil is best adapted to the growth of the Soy bean. The soils of the fertile prairie, therefore, are a natural home for it. On poor, sandy soils it will not make a large growth unless these are first fertilised.
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> The preparation of the soil should be such as to make a deep, fine, firm and moist seed-bed. When the Soy bean is planted after a grain crop which has just matured, a free use of the harrow and roller should be made in a normal season to conserve moisture. When sown from the grain, for ensilage, for soiling food, or for hay, the seeds are put in with the grain drill. But they may also be planted with a corn-planter or a bean-planter. It is customary to make the rows about 30 inches apart. If the crop were grown for pasture, the rows could be made considerably closer, under some conditions, but not so close as to preclude cultivation, except such as may be given with the harrow. When the rows are 30 inches apart, from 2 to 4 pecks of seed will suffice per acre. At no time should the seed be sown earlier than the corn-planting season, and in districts subject to late frosts it ought to be planted later. In the cooler districts early varieties only should be sown, and even in the hotter localities very late varieties ought not to be used.
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> In cultivation, a harrow with the teeth aslant can be used with advantages before the beans are up, and also in some instances at a later period. The cultivation should be prompt and generous, more especially when the plants are young. For making hay the Soy bean should be cut when the beans in the pod are fully half-grown, or before the lower leaves begin to fall freely, and the aim should be to handle it but little during the curing process, lest many of the leaves should be lost. When mixed with corn in the silo the quality of the ensilage is thereby considerably improved.

POISONING FOXES.

THE spread of foxes in sheep districts hitherto free from these mischievous pests is a trouble that should be nipped in the bud. Unfortunately the sheepowners of Victoria and the border are not unaccustomed to loss of lambs by Mons. Reynard, and their experience is something by which we may profit.

For the information of those unacquainted with practicable methods of destroying the animals, the following extracts from correspondence in the *Australasian* and *Leader* have been collected. It will be noticed that all the gentlemen who have been good enough to contribute on the subject lay especial stress upon the importance of preparing the baits in a way that will ensure freedom from foreign odours, such as might be imparted to meat by the use of a knife used for cutting tobacco, etc. It is clear, too, as the Riverina correspondent points out, that, by commencing operations before the lambing season, the best results can be achieved.

Mr. D. J. Cameron, Dalyenong, writes:

I notice that there are inquiries as to the best means of poisoning foxes. As this subject is of importance to many of your readers, I venture to describe the method we have adopted here, and which has been followed by our neighbours, the result being always successful. The first and most important thing is the bait. We use congealed blood, sheep's liver, and mutton, cut into pieces about an inch square. Put a cut in the bait, and drop in as much strychnine as you can carry on the small blade of a pocket-knife. We prefer strychnine without any colouring in it. Do not on any account handle the bait, or do not let it touch anything that you have been handling. When cutting the bait up use a pointed stick for a fork; do not use deal wood. Before using your knife, stick the blade several times in the ground, in order to remove all foreign smells, as the fox has wonderfully keen sense of smell, and is terribly suspicious, even when hungry. Drag a newly-skinned sheep, or bundle of skinned rabbits, behind a trap, and right in the trail place baits at intervals of about 100 yards. Skim with a sharp spade about an inch thick as much of the surface as will cover the bait, the grassy side upwards. Burying the bait keeps the ants away, and prevents birds taking it. The fox will take a buried bait more readily, and it is a mark to pick up the bait if you wish to do so. Lay your baits as late in the afternoon as possible. Place the baits on or as near rabbit burrows as is practicable. If these instructions are carried out properly, I have no fear of the result. I may mention that on one occasion we poisoned thirty-six foxes within a fortnight by the above means.

Mr. J. F. Wyatt, Maryborough, writes: *Re* inquiries as to different methods adopted for poisoning foxes, the following are a few of the means used successfully:—Take an old lean sheep to some part of the run where foxes are known to visit frequently (their natural haunts are scrubby parts of the run, rocky, hilly country, or along water-courses, especially if there are any rabbit-warrens about); kill the sheep, and skin it, taking care not to touch fleshy parts with the hand. After being skinned place a rope around the sheep's neck, and drag the carcase in a zig-zag manner for about 60 yards. Then cut open the shoulders from the brisket (taking care not to cut it clean off). Raise the shoulder up, and scarify the fleshy part with a knife (not a tobacco knife), also the brisket; then sprinkle powdered strychnine on both parts. Replace the shoulder in its natural position. Take hold of the hoof, and work the shoulder to and fro for a minute or two. This will have the effect of working the poison well into the flesh. Also run the knife from brisket along the fleshy part of neck up to the jawbone in a slanting position (both sides); place some strychnine on point of knife, and press well into flesh. Then close the cut, and press together firmly. Make slanting cut along the back on both sides, from shoulder to hip, and poison likewise. The fleshy parts of hind legs also poison in same manner. The heart and liver are tempting baits, and the clotted blood. These should be poisoned in the carcase, and not removed. Some good trials could be made by saving some blood, and place on inside of skin. Make a circle a good distance from the carcase by dragging the skin, fleshy side, on ground, and from the circle trails leading to the carcase. I have found this plan to act very successfully, and have picked up dead foxes some four weeks after the bait has been laid. Another good plan is to roast some plucks. Drag along the ground some distance, and then drag lightly in some sand. In both cases care must be taken not to touch the baits with the hands. Always buy white strychnine in large flakes, never pulverised or coloured. Half an ounce of strychnine can be (with care) powdered into 1-oz. bottle. Foxes are very cunning, and seem to almost perceive the thoughts of the shepherds, but by observing their habits (foxes) closely, they can be cleared out of any kind of country. I always prepare to get rid of foxes from two to three weeks before ewes commence lambing. Any lambs found killed by these animals poison in same way, but do not remove the skin. Drag the bait about 20 yards away, and leave in as natural position as possible.—*The Leader.*

A some-time station-manager writes: I have noticed lately in your columns numerous questions from correspondents, mainly from the Riverina, as to the best means of getting rid of foxes. I have been waiting for some abler pen to take the matter up. Mr. Wyatt gave some information, but no details to guide those troubled with the pest. When I took charge of Kimbolton for Messrs. Dalgety & Co. the place was overrun with foxes, especially along the rocky land adjacent to the river Campaspe and in the timber reserves, and more especially in the old alluvial workings all over the estate. The first lambing I had there the foxes committed great havoc among the lambs, this being especially noticeable among the merino ewes, which, being of a more timid nature than the crossbred ewes, were easily intimidated by the foxes, and whose lambs, left to themselves, became an easy prey. I laid a lot of poison, but when the foxes could kill their own lamb they preferred it to any bait, although I got a few foxes by poisoning any lamb fresh killed when the fox (which sometimes happened) came back for a second meal. The following year I took time by the forelock, with pronounced success. A month before the lambing commenced I bought an old bull for 10s., which I slaughtered and cut up into 1,500 small baits, most of which I roasted and some I left raw. For a trail I roasted some of the ribs and dragged behind me on horseback, and about every mile or so I got off and lit a fire and gave the drag another roasting, by this means keeping the scent strong. To carry the bait I had an ordinary wheat bag, sewn up each end, but cut open across the centre on one side. This bag was slung across the seat of the saddle, and each end filled with an equal weight of bait to balance it, pannier fashion. For handling the bait I had a small piece of pointed fencing wire. Where the foxes were thickest the baits were laid more plentifully. It took two of us two days to lay that old bull and to prepare the bait with strychnine, but the result was an ample reward, as we got forty foxes, and by some later poisonings with dead mutton for bait we got twenty odd more. In all for the month we got sixty-four, besides twenty dogs belonging to neighbouring farmers and wood-carters (which in most cases, according to their owner's account, never left home). In this way I had the foxes eradicated before the lambing commenced. There is no trouble in getting rid of foxes as long as you poison well before lambing commences—then the foxes take bait greedily—but when once the lambs come, then they prefer to be their own butchers, and are very difficult to get rid of. In the year on which I got so many foxes a neighbour, Mr. James Paton, lost over 40 per cent. of his lambs through not poisoning early.—*Australasian.*

SHEEP MANURE.

PROF. ROBERTS, of Cornell University, states that in the course of a year one sheep will produce 3 dollars 17 cents worth of manure, provided of course there is absolutely no waste by leakage or exposure to unfavourable conditions.

CULTIVATING LAND IN SPRING.

ON the farm, and with modern improvements in farm implements, the hardest part of spring cultivation of soil is done by the horse, and even thus the horse does not have to work so hard as he used to do. Men have learned that all spring ploughing and spring cultivation is best if it be kept within a few inches of the surface, whether the soil be heavy or sandy. Not more than 5 or 6 inches depth of ploughing is required for growing corn, and an inch more of soil is enough to grow potatoes on, as this crop will bear, and even requires, much deeper planting than corn. Both after planting need only shallow culture, but without any attempt to pile soil around the plant, making a conical hill, from which water is turned to the space between the rows. This is scraped nearly bare of earth to make the hill. The result is that millions of weed seeds grow up between the rows and receive more rain than do the potato roots, enclosed as these are by a mass of earth raised into a cone around the stems.

It was once the common practice for farmers to use what were called shovel ploughs to run between the corn and potato rows, turning the mellow soil down to the depth of the furrow from the centre each way towards the rows of corn and potatoes on either side. This was always followed by severe check to growth, as millions of the best feeding roots were destroyed. If a dry time followed this severe root-pruning the crop was always destroyed. As this ploughing out was usually done late many farmers came to learn that late cultivation was an injury rather than a benefit. It was not, however, the lateness of the cultivation, but its destructive character that did the mischief. If all the previous cultivation had been shallow it may be kept up with advantage until the crop is nearly ready to be harvested. We always made a rule to go through corn with a narrow tooth cultivator until the ears stuck out so far that they broke off as the horse brushed against them on either side.

During all the season every rainfall that wets down into the soil should be followed by cultivation. This in early spring is necessary to break the hard crust which forms on all soil containing any clay when compacted on the surface by beating drops of rain falling upon it. This hard crust keeps out light and heat, both of which seeds and plants need, and which, if continued too long, may cause the seed to rot in the soil rather than grow. Breaking this crust to the depth of two and a half inches exposes a much larger surface of soil to the air, and it also sets up a fermentation in all the organic matters which the soil contains that liberates gases and mineral fertility that are found there. In early spring, so soon as the rows can be seen for a horse to go through, the shallow narrow-toothed cultivator should be set to work in the corn and potato fields, and even before the plants are up the field should be harrowed once or twice to destroy the small weeds over the entire surface. If this be done thoroughly, all the after cultivation, both of corn and potatoes, may be done with the cultivator with horse-power and without permitting a weed to live. The best crops of corn we have ever seen were made without the use of a hoe, the harrow cutting over the whole surface and killing all the weeds early, and the cultivator, with light teeth, turning a slight sprinkling of soil towards the plants and the next time turning it towards the centre by setting the teeth the other way. In this way all the weeds are killed while extremely small, which is always the best time to kill any weeds.

Potatoes, we found, always required a little hand-pulling of weeds in the hills, because the harrowing of the whole surface cannot be safely continued long after the potatoes are up. Any bruising of the potato leaves, either by the harrow or their soiling by contact with wet earth or dry earth or wet leaves, is likely later to be followed by leaf blight and the loss of the crop. The practice, once prevalent, of covering potatoes after they are up with a three-cornered coverer drawn astride the rows by two horses once or twice while they are small, and then dragging the ridges down, has had to be abandoned, because it was found that it caused blight and crop failure. It was much too easy a way to kill weeds not to have some serious objections. Potato-growing cannot be made easy work anyhow we may fix it. Even if we can grow the crop mainly by horse labour, a large crop of potatoes, say several hundred bushels, requires a great deal of work in assorting them and putting them into baskets or other receptacles, so that they may be measured or weighed. No machine can be invented that will pick up potatoes and not also pick up stones or lumps of earth where these are found.

The secret of growing hoed crops cheaply lies in beginning right, and this should be done by such thorough preparation of the soil that seeds put into it will start to growing at once. As the seed swells it presses more closely against the damp soil around it, at the same time putting forth roots, each of which has at its end enough of nature's solvent carbonic acid gas to make plant-food that is near it available for plant use. So the valuable grain plants having large seeds soon become so firmly rooted that the harrowing which destroys the smaller annual weeds only benefits them. After every spring rain there will be a new crop of weeds start, and it is then important that either the harrow or cultivator should be set to work in all hoed crops. Often in early spring rain falls many days in quick succession. Happy is the farmer whose land is underdrained so that he can take advantage of the brief periods between the showers so as to prevent the weeds getting the start of him that they otherwise would.—*American Cultivator.*

PLANTING AND CULTIVATION OF CORN.

THE *cultivation* of corn should begin with the ploughing of the ground. The best depth to plough will depend altogether on the kind of soil and the condition of the field. Many fields cannot be ploughed the same depth throughout the whole length. Often one end or the other of the field, or probably the middle, is low. Then the side of the hill may be quite steep, with most of the surface soil washed off. Low places and these washed hillsides should not be ploughed more than 4 inches deep. Give such spots a good dressing of manure before harrowing. Another point in this section is to avoid ploughing when the ground is too wet.

On level and moderately dry land, plough to a depth of 8 inches. The ground will then hold more moisture and the corn suffer less from drought. If farmers would plough their ground in the fall and seed to rye, the roots of the growing rye would prevent washing and would catch and hold the fertility which otherwise would leach through the soil. In the spring it will only be necessary to plough to a depth of

2 or 3 inches. Begin harrowing as soon as the ground will permit, going once each way before planting, or as many times as is necessary, to pulverise the seed-bed. The distance between the rows of corn and the thickness of planting depend entirely upon the quality of the land, and every farmer must be his own judge. In some localities one stalk every foot in rows 4 feet apart is sufficient. When the land is rich, more can be planted.

As soon as the corn is planted, the ground should be harrowed again, and ordinarily the fields should receive another harrowing just before the corn comes to the surface. The crop will not be injured. When the rows can be seen across the field, go over with a weeder or an A harrow. Cultivate once each way in this manner, then use an ordinary corn cultivator, going over the field not more than three times with this implement. In very dry seasons, twice is sufficient. Much corn is ruined by deep and close cultivation, for if the roots are once disturbed, the crop will never fully recover. After the last cultivation, I go through the field once each way with a small one-horse harrow, which runs between the rows. If the season has been at all favourable, the crop will need no further attention. When the husks on the ears have turned yellow, cut and put in shocks 12 to 14 feet square.—W. M. KNOVER, Tennessee.

THE FARMER'S MARKET GARDEN.

A COUPLE of issues back there appeared, with an illustration of the lay-out of what in America is regarded as a prize market garden, some particulars as to the commercial results that can be achieved in a well-cared for and intelligently worked little plot of land. The complete returns of the garden contest for prizes offered by the *American Agriculturist* are now to hand and afford a good idea of what value an odd corner devoted to vegetables can be made to the farmer and his family.

In tabulating the entries it was found that the average size of farm gardens was a trifle over half an acre. Taken altogether, the farm gardens had an average of 36 per cent. of their produce for sale after meeting all household wants in the way of vegetables, and thus in the aggregate proved a source of revenue.

The value of productions was 85 dollars per garden, or at the rate of about £35 per acre, and the net profit was 41·33, or at the rate of about £17 per acre. This is more than any farm crop can approach. Now, if these gardens can be extended to four times the size, or greater, they will become quite an important source of the farmer's income. On the majority of farms the lack of a good near-by market will prevent the attempt at gardening on a commercial scale, except in favoured localities specially adapted to certain crops; but where one is located within 5 miles of a good-sized village or city, a small market garden may be made a considerable source of revenue.

There are two lines of gardening which may be followed: First, general gardening, in which most of the common kinds of vegetables are planted and marketed at wholesale, at stores and butchers' shops, or at retail by peddling from house to house; second, special gardening, in which only a few kinds are grown, such as may be raised with the least amount of labour, those which are in greatest demand, or those for which a certain plot of ground is particularly well adapted. Local conditions and circumstances must govern which kind of gardening each should attempt. If one takes up market gardening as the main part of his work, the most profit will be found in growing a full line of vegetables and selling at retail, unless he produces them in such large quantities that this method is impracticable; but where the work is taken up in connection with running a farm, and partly as a side issue, it will be found more profitable generally to raise only a few kinds of such sorts as can be harvested and marketed in large quantities—such, for instance, as onions, squash, turnips, carrots and sweet corn.

The small market gardens of those contestants who sent in reports gave a net profit of £23 per acre. They averaged 2¼ acres in size, were valued at £28 per acre, and produced 447·73 worth of products, or at the rate of £40 per acre, at a cost of 187·27, or £16 per acre. The value of tools used was 55·57. The labour cost 111·61, seed 15·50, fertiliser 22·25, interest and taxes 24·17, use of tools 3·89, and incidental expenses 6·85. These latter included barrels, boxes and baskets, twine, poles, insect poisons, etc. The family consumed 15 per cent. of the total productions, or 67·15 worth, which is considerably more than the amount used from the farm and village gardens. This is partly accounted for by the fact that the sweet corn fodder, poor cabbage, and many of the beets, turnips, and carrots were fed to the stock, and figured in with the amount consumed. It is highly probable that the actual average consumption per family was also greater, owing to there being a greater abundance of vegetables on hand at all seasons.

Reducing the figures to a basis of an acre, we find the cost of labour to be 49·60 dollars, seed 6·88, and fertiliser 9·88. The figures for seed and fertilisers seem somewhat low, particularly for the latter. This would buy but one-fourth ton of a high-grade commercial fertiliser, while 1,500 lb. would not be an excessive amount, and many gardens use much more. The price of seeds at wholesale is much lower than that quoted in retail catalogues, and this figure would probably average about right. The price for labour includes marketing and preparing the vegetables for market, and is very reasonable.

Where market gardening is carried on as a business, these figures would be greatly changed. Not only would the cost for fertilisers be increased from four to sixfold, the labour cost doubled for some crops, but the gross sales per acre would be materially increased; yet it is doubtful if a higher rate of profit, or of net profit, per acre could be shown. But the acreage being greater, the gross returns and net proceeds would be more.

In comparison with the above returns, it is worthy of note that when the Department of Agriculture offered national prizes for farms and orchards some years ago, a Goulburn competitor, in supplying the judges with details as to his annual profits, stated that from 2 acres devoted solely to vegetables and from odd patches in his orchard, he derived a supply sufficient to maintain a cart trade which returned £4 per week all the year round.

According to the latest statistical returns, there are in New South Wales some 7,636 acres devoted to the production of vegetables, estimated to be worth £184,302, which gives a return of something like £24 per acre. When in the course of a few years the area devoted to raising vegetables shall have extended more to districts like those on the Southern line, where Europeans can raise and market infinitely better vegetables and more of them than the suburban Chinese gardener, it is quite possible that the New South Wales returns will approach, if not exceed, the American. What is really required for the promotion of the vegetable-raising industry is more co-operation of district growers, so as to be in a position to market in sufficient bulk to secure freight concessions.

A FRUIT-SELLING ASSOCIATION.

A WRITER in the *American Agriculturist* gives the following account of a fruit-shipping and selling association, which may be of interest to growers and sellers in this Colony. It appears that at a place called Hammonton, in New Jersey, the fruit-growers had a union which came to grief in 1898. It was a composite institution, combining a co-operative store with co-operative shipping. The store section is blamed for the failure; the shipping branch was a success. As a result of this experience, the fruit-growers have formed a new organisation called the Shippers' Union.

According to Mr. L. Myrick, the working plan is very simple. When any number of fruit-growers wish to combine, they organise and elect executive officers. The proper official then arranges with a few responsible commission merchants in each of the cities to which shipments are made, such as Boston, Providence, New York, Philadelphia, etc., to receive and sell the fruit, and shipments are made only to these men. Early every morning telegrams giving market quotations are received by the union from these commission men, which are promptly printed as a bulletin and distributed to all members by boys on bicycles. Thus the grower knows by 1 or 2 o'clock what are the market conditions in the leading cities, and bills the goods for that day accordingly. Members live scattered through the country, from a few rods to a few miles from the depôt. A member makes his own selection, from the union list, of commission men to whom to ship, and cards his crates before leaving home, but goods are billed by the union, all the New York shipments, for instance, going in one or more cars. Remittances are made direct to the grower by the commission men, deducting freight, cartage, and 10 per cent. commission. Of this 10 per cent. commission the merchant remits 3 per cent. to the union, which is used by the union to meet expenses of telegrams and printing and distributing same, of ice and of shipping superintendence.

Practically, no capital is required to run a shipping union according to this plan, as the 3 per cent. more than covers the expenses. For the first season the expenses that must be met before the 3 per cent. is received are provided for by a membership fee of 1 dollar; after that no capital is required. The final disposition of the unexpended funds coming from the 3 per cent. differs with different organisations. The old union put it into a store and buildings; the others do without buildings (except an ice-house) and distribute the balance to the growers *pro rata* according to the shipments made by each. In the early years of such an association, the 3 per cent. balance is allowed to accumulate until large enough to build an ice-house. Of course, the expense of filling the ice-house comes out of the surplus before distribution.

The daily bulletins are a great convenience. It does a man good to post him about the great markets and let him make his own selection of markets and men to whom to ship; the liberty given to his individual action and judgment is in keeping with the independence of the life he leads, and makes one of the most attractive features of the system. A bulletin, however, becomes public property, and it was believed the old union bulletins were used surreptitiously by members of rival associations. This trouble is avoided where one union controls a shipping district.

There is less risk in shipping through a union than privately, because the commission men selected are financially responsible, and they are further induced to walk in the path of virtue through fear of being removed from the union's list, as would follow in the event of bad faith or rascality. The amount of fruit a commission man receives through a union is of course much larger than if shipments were made by individual growers.

Replies to Correspondents.

Lumps on Cows' Teats.

In answer to a number of inquiries that have been received as to the cause of lumps on cows' teats, Mr. P. Quirk, of the Berry Stud Farm, reports:

This seems to be calling forth much argument in the *Gazette*, and to my mind the keynote of the mischief has not been struck. I have had experience for over twenty years in the care and management of stock and milking since I was a lad, so should know something about the matter, and I always found lumps on the teats were caused from bad milking. I never allowed a man or boy in the yard who did not milk full-handed. I do not believe in stripping, unless the last few drops—by stripping is meant pulling the teats between the finger and thumb. What I call bad milking is milking full-handed for a few draws, and then strip a few; worse still, if it is done with a jerk. You can teach the cow habits, good or bad. If she is milked full and strong, you will find, after a time, she will let her milk down quickly, and almost milk out dry full-handed; and a hard or tough cow can be made easy with good milking. I do not think strong wrists have much to do with the matter; I prefer the man that milks full and strong, but not rough—say at the tune of ten cows per hour in full milk. But the man that milks a cow full-handed for a few draws, and then strips a few, will give a cow sore teats, lumps, and cords, so the best thing to be done is to teach him differently, or get rid of him; but with a little practice, any man should be able to milk a cow out full-handed, unless the last few drops; and I can never see where this stripping business comes in to a good milker, and I always look upon the man that speaks of stripping as a theoretical milker, and knows but little about the art of milking.

Orange-borers in the Windsor District.

At the invitation of Mr. W. Moses, of Windsor, the Entomologist recently visited a number of orchards in that district to report upon the damage done to citrus trees by the orange-borer. Mr. Froggatt's report is given below, and will be of interest to many growers whose trees are similarly affected, and who have consulted the Department for advice on the matter:—

"The pest that is destroying the orange trees is the long-legged brown weevil, popularly known as the elephant beetle *(Orthorrhinus cylindrirostris)* which was recorded in the *Agricultural Gazette* ten years ago as doing similar damaeg in the Parramatta district.

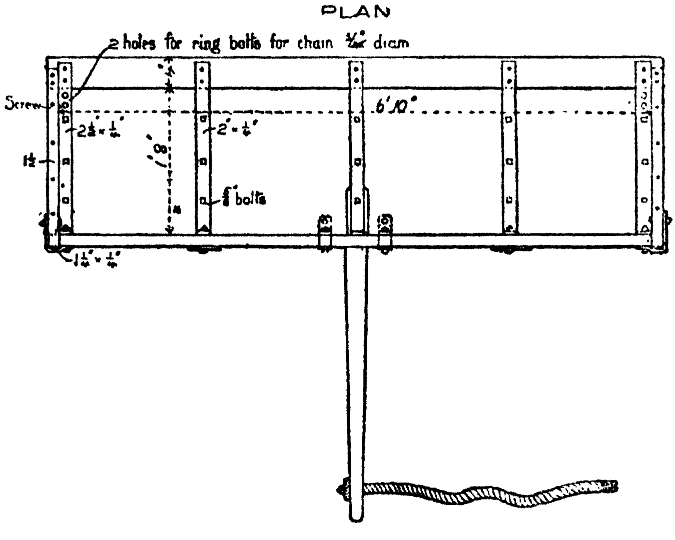
"These beetles are common in our native bush, appearing early in November, and may be found feeding upon the bark of various garden and forest trees. The eggs are deposited beneath the bark, the insect boring a hole with her sharp jaws at the tip of her long snout. The little grubs, as soon as they are hatched, feed down into the roots, remaining in the grub state until a few weeks before they are ready to emerge, when they change into the pupal stage, and after casting the pupal skin, gnaw their way out through the trunk, leaving behind them a round hole over a quarter of an inch in diameter. Many of the trees examined had a dozen or more of these holes, from a couple of inches above the surface to nearly a foot up the trunk; and when a tree has been infested in this manner, all the main roots are tunnelled through, and the tree will never do any good.

"Unfortunately, they now attack nursery stock, and one orchardist assured me that he had lost over 1,000 young trees last season.

"*Remedies.*—Destroy all dead or dying trees in or near the orchard, keep the trunks of the trees well earthed up during the early summer, and wash or spray the exposed portion of the trunk with carbolic soap wash. Collect all the beetles, by hand picking or jarring the tree after placing a sheet beneath it, and destroy them. These beetles, unlike other groups of 'borers,' cannot be destroyed by squirting kerosene into the holes, as not only are the openings grown over, but the tunnels are packed with the gnawed wood between the opening and the grub."

A Soil Leveller.

In response to inquiries as to the best means of levelling orchard soils, the accompanying illustration of Mr. Allen's Buckscraper, described



by him in the *Agricultural Gazette* for November, 1898, p. 1398, is reproduced.

AGRICULTURAL SOCIETIES' SHOWS, 1900.

Society.	Secretary.	Date.
Dapto A. and H. Society	A. B. Chippindall	Jan., 10, 11
Thornleigh and District Horticultural Association	Fred. N. Brack	,, 13
Albion Park A. and H. Association	H. Fryer	,, 17, 18
Kiama Agricultural Association	James Somerville	,, 25, 26
Gosford A. and H. Association	W. McIntyre	,, 26, 27
Wollongong Agricultural Association	J. A. Beatson	,, 31, Feb., 1, 2
Agricultural and Horticultural Society, Shoalhaven	R. Leeming	,, 8, 9
Manning River (Taree) A. and H. Association	W. Plummer	,, 9, 10
Alstonville Agricultural Society	N. R. Elvery	,, 14, 15
Moruya A. and P. Society	John Jeffery	,, 14, 15
Lithgow Agricul., Horticul., and Produce Society	M. Asher	,, 15, 16
Ulladulla A. and H. Association	C. A. Cork	,, 21, 22
Tumut Agricultural and Pastoral Association	M. McNamara	,, 21, 22
Central Richmond River Agricultural Society	D. Cameron	,, 22, 23
Cobargo A., P., and H. Society	T. Kennelly	Mar. 1, 2
Robertson Agricultural Society	R. E. Ferguson	,, 1, 2
Berrigan A. and H. Society	R. Drummond	,, 7
Canowindra P., A., and H. Association	A. E. Smith	,, 7
Tenterfield I. P., A., and M. Society, Show	T. W. Hoskin	,, 6, 7, 8
,, ,, Fair days	,,	,, 9, 10
Candelo A. Association	C. H. Brooks	,, 7, 8
Campbelltown A., H., and I. Society	A. R. Payten	,, 7, 8
Walcha Pastoral and Agricultural Association	F. Townshend	,, 8, 9
Oberon A., H., and P. Association	Alf. Gale	,, 8, 9
Port Macquarie and Hastings District A. and H. Society	J. Y. Butler	,, 8, 9
Berrima District A., H., and I. Society (Moss Vale)	James Yeo	,, 8, 9, 10
Campbelltown A., H., and I. Society	A. R. Payten	,, 9, 10
Lismore A. and I. Society	T. W. Hewitt	,, 7, 8
Cudal A. and P. Society	C. Schramme	,, 14
Bega A., P., and H. Society	J. Underhill	,, 14, 15
Central New England (Glen Innes) P. and A. Assoc.	John Priest	,, 14, 15, 16
Nepean District A., H., and I. Society	E. K. Waldron	,, 14, 15, 16
Macleay (Kempsey) A., H., and I. Association	E. Weeks	,, 14, 15, 16
Goulburn A., P., and H. Society	J. J. Roberts	,, 15, 16
Cumnock P., A., and H. Association	W. L. Ross	,, 20, 21
Bombala Exhibition Society	R. H. Cook	,, 20, 21
Armidale and New England P., A., and H. Association	W. H. Allingham	,, 20, 21, 22
Mudgee Agricultural Society	J. M. Cox	,, 21, 22, 23
Inverell A. and P. Society	J. McGregor	,, 21, 22, 23
Camden A., H., and I. Society	C. A. Thompson	,, 21, 22, 23
Crookwell P. and A. Association	J. W. P. Levy	,, 22, 23
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28, 29
Clarence P. and A. Society (Grafton)	J. C. Wilcox	,, 28, 29
Blayney A. and P. Association	H. Woolley	,, 28, 29
Gundagai P., A., H., and I. Society	A. Elworthy	,, 29, 30
Lower Clarence (Maclean) Agricultural Society	Geo. Davis	April 3, 4
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 4, 5
Cooma P. and A. Association	C. J. Walmsley	,, 4, 5
Upper Hunter (Muswellbrook) P. and A. Association	J. C. Luscombe	... *
Orange A. and P. Association	W. Tanner, junr.	April 4, 5, 6
Warialda P. and A. Association	W. B. Geddes	,, 4, 5
Royal Agricultural Society of New South Wales (Sydney)	F. Webster	,, 11-21
Rylstone H. and A. Society	W. Taylor	,, 25, 26
Bathurst A., H., and P. Association	W. G. Thompson	,, 25, 26, 27
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	,, 25, 26, 27
Wellington P. and A. Society	James Thompson	May 2, 3
Moree P. and A. Society	S. L. Cohen	,, 2, 3, 4
Upper Manning A. and H. Association, Wingham	Wm. Dimond	,, 3, 4
Durham (Dungog) A. and H. Association	C. E. Grant	,, 9, 10
Richmond River A., H., and P. Society (Casino)	Jas. T. Tandy	,, 10, 11
Hawkesbury District A. Association (Richmond)	C. S. Guest	,, 10, 11, 12

Society	Secretary	Date
Gunnedah P., A., and H. Association	J. H. King	May 15, 16, 17
Nyngan A. and P. Society	J. C. Cahill	,, 16, 17
Coonamble P. and A. Association	F. C. Lamotte	,, 23, 24
Deniliquin P. and A. Society	H. J. Wooldridge	July 19, 20†
Wentworth P. A., and I. Society	J. W. Thorn	,, 18
Riverina P. and A. Association (Jerilderie)	Wm. Elliott	,, 24, 25
Hay P. and A. Society	G. S. Camden	,, 25, 26
Condobolin P and A. Association	D. H. Tasker	,, 25, 26
Balranald P. and A. Society	— Murray	Aug. 1
Forbes P. A. and H. Association	N. A. Read	,, 1, 2
Parkes P. and A. Association	G. W. Seaborn	,, 8, 9
Lachlan Pastoral and Agricultural Association (Hillston)	Thos. Cadell	,, 10
Corowa P. A. and H. Society	E. L. Archer	,, 14, 15
Gunnedah P. A., and H. Association	J. H. King	,, 21, 22
Cootamundra A., P., H., and I. Association	Thos. Williams	,, 28, 29, 30
Northern Agricultural Association, Singleton	Ch. Poppenhagen	,, 29, 30, 31
Murrumbidgee P. and A. Association (Wagga Wagga)	R. E. Shorter	Sept. 5, 6
Grenfell P., A., and H. Association	Geo. Cousins	,, 5, 6
Manildra P. and A. Association	G. W. Griffith	,, 5
Albury and Border P., A., and H. Society	Geo. E. Mackay	,, 12, 13
Burrangong P. and A. Association (Young)	Geo. Ward	,, 12, 13
Yass P. and A. Association	F. C. Mackintosh	,, 13, 14
Moama A. and P. Association	C. L. Blair	,, 19
Cowra P., A., and H. Association	H. Smith	,, 19, 20
Junee P., A., and I. Association	G. W. Scrivener	,, 19, 20
Burrowa P., A., and H. Association	Fred. H. Trout	,, 21, 22
Millthorpe Agricultural Association	S. C. Francis	,, 25, 26§
Temora P., A., H., and I. Association	W. H. Tubman	,, 26, 27
Germanton P. A. and H. Society	G. T. S. Wilson	,, 26, 27
Namoi P., A., and H. Association (Narrabri)	J. Riddle	Oct. 10, 11
Tweed, Brunswick, and Border P. and A. Society (Murwillumbah)	R. Campbell	Nov. 28, 29

1901.

Society	Secretary	Date
Dapto A. and H. Society	A. B. Chippindall	Jan. 9, 10
Berry Agricultural Society	A. J. Colley	,, 22, 23, 24
Wollongong A. and I. Association	J. A. Beatson	Jan. 31, Feb. 1, 2
Kiama A. Association	Jas. Somerville	,, 26, 28
Shoalhaven A. and H. Society	R. Leeming	Feb. 13, 14
Alstonville Agricultural Society	Henry R. Elvery	,, 26, 27
Armidale and New England P., A., and H. Association	W. H. Allingham	Feb. 27, 28, Mar. 1
Tenterfield Intercolonial, P., A., and M. Society	F. W. Hoskin	Mar. 5, 6, 7‡
Berrima District A., H., and I Society (Moss Vale)	Jas. Yeo	,, 7, 8, 9
Lismore A. and I. Society	T. M. Hewitt	,, 12, 13
Central New England (Glen Innes) P. and A. Assoc.	Geo. A. Priest	,, 12, 13, 14
Crookwell P. and A. Association	M. P. Levy	,, 21, 22
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Inverell P. and A. Association	T. P. Borthwick	,, 20, 21, 22
Warialda P. and A. Society	W. B. Geddes	,, 27, 28
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 27, 28
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28
Upper Hunter P. and A. Association (Muswellbrook)	J. C. Luscombe	,, 27, 28, 29
Royal Agricultural Society (Sydney)	F. Webster	April 3, 10∥
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	Apr. 17, 18, 19
Orange A. and P. Association	W. Tanner, jun.	April 25, 26
Durham A. and H. Association (Dungog)	Chas. E. Grant	May 2, 3

* Show postponed till 1901. † Sheep Dog Trial, 23 May. ‡ Fair Days, March 8, 9.
§ Show and Intercolonial Champion Ploughing. ∥ Entries close 6 March, 1901

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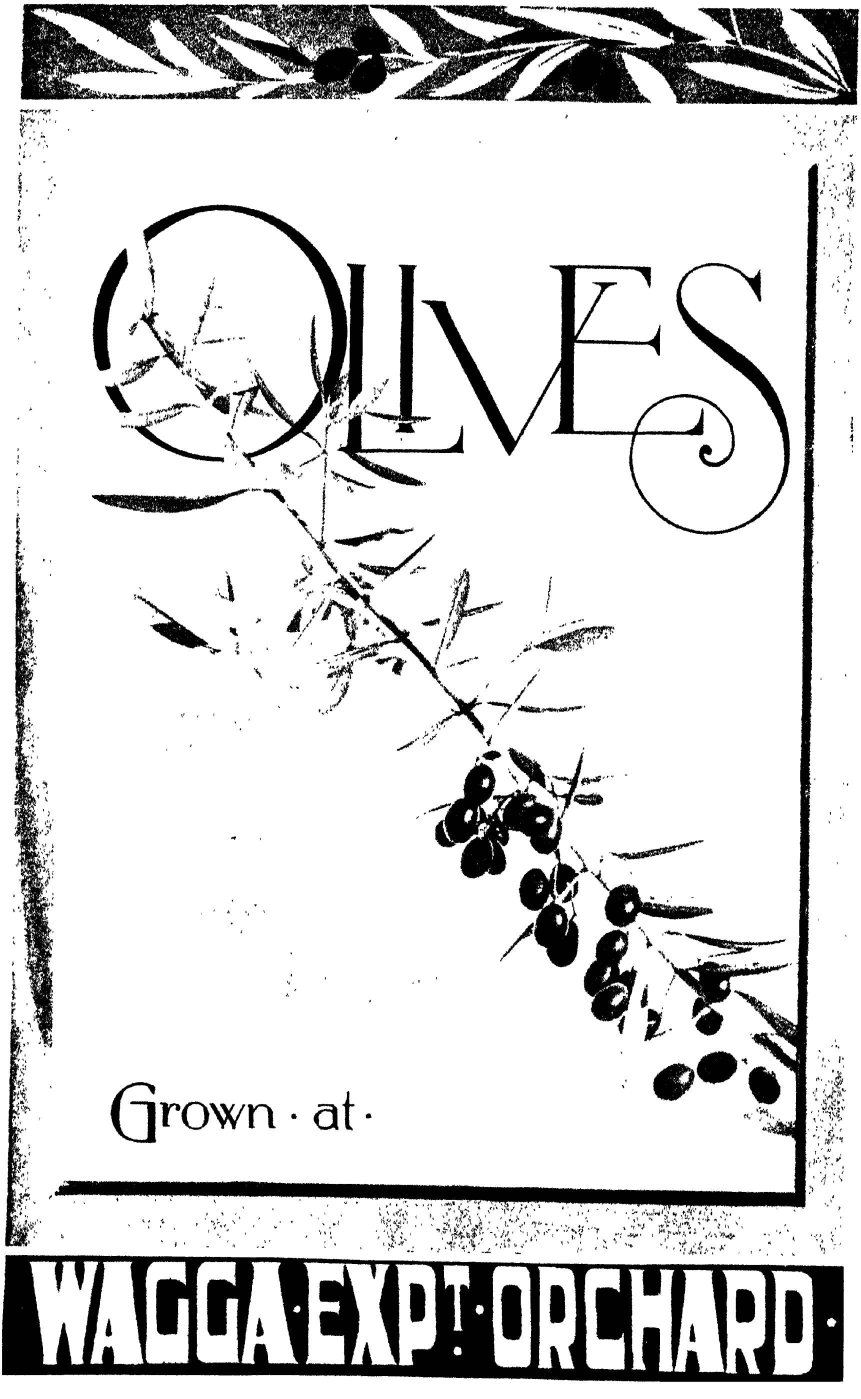

Olives
Grown · at ·
WAGGA·EXPT.·ORCHARD·

Olive Culture.

W. J. ALLEN

THE culture of the olive and the manufacture of oil have not heretofore received from the fruit-growers of Australia generally the attention which they deserve. We are certain that this tree will thrive in many parts of this Colony where the winters are not too severe, and apparently we have no climate too hot for it, as it is found growing in perfection and fruiting at both Wentworth and Bourke, which are two of our warmest districts. It has been found that the olive will do best on soils rich in lime, particularly in the mallee country, where I have seen it growing and fruiting heavily under irrigation in soils where no other fruit-tree could live. It is growing well in many of our warmer districts, and is doing well at Moree, Hay, Corowa, Wagga, and many other districts with similar climates; but at Wollongbar, on the Richmond River, this tree has not proved a success. There are a few trees growing at the Government Experiment Farm there, but the leaves are a pale, sickly colour, and the trees are not making a proper growth, and, therefore, I could not recommend growers in that or similar districts planting this tree until further experiments have been made to ascertain if the addition of lime to the soil would prove of sufficient benefit to justify their doing so.

Like the palm, the olive will grow in many places where it will not fruit well; for instance, in some countries it is said not to fruit well in hot climates, nor will it stand sudden changes from cold to hot, or *vice versa*, nor endure heavy frosts. It requires as equable a temperature as possible, and protection from frosts and heavy autumn winds, which are apt to shake down the berries. It is a well-known fact that the olive-tree will live to a very great age, and when once a grove is established it is good for generations, provided the conditions are favourable.

Spain, Italy and France are the largest oil-producing countries of the world, but they are all heavy consumers, and consequently France, to become an exporter, it is said, has to be an importer first. The old countries are all heavy consumers of oil. In many cases they are not too careful how they make it, and much of it has been of an inferior grade.

In both South Australia and Victoria this industry has received considerable attention. Sir Samuel Davenport was, I believe, one of the first to plant the olive extensively, and from his orchard in South Australia a good many truncheons have been distributed through the colonies. These have grown up to trees, and are now bearing good crops of fruit. Mr. Charles Chaffey, of Renmark, in South Australia, has also planted rather extensively, and has made some remarkably good oil. Mildura, in Victoria, where, as at Renmark, the olive is grown under irrigation, is also coming to the front with some good oils, and at the Dookie Agricultural College good work has and is still being done in this industry. Wherever these oils have been tested they have been spoken of very highly.

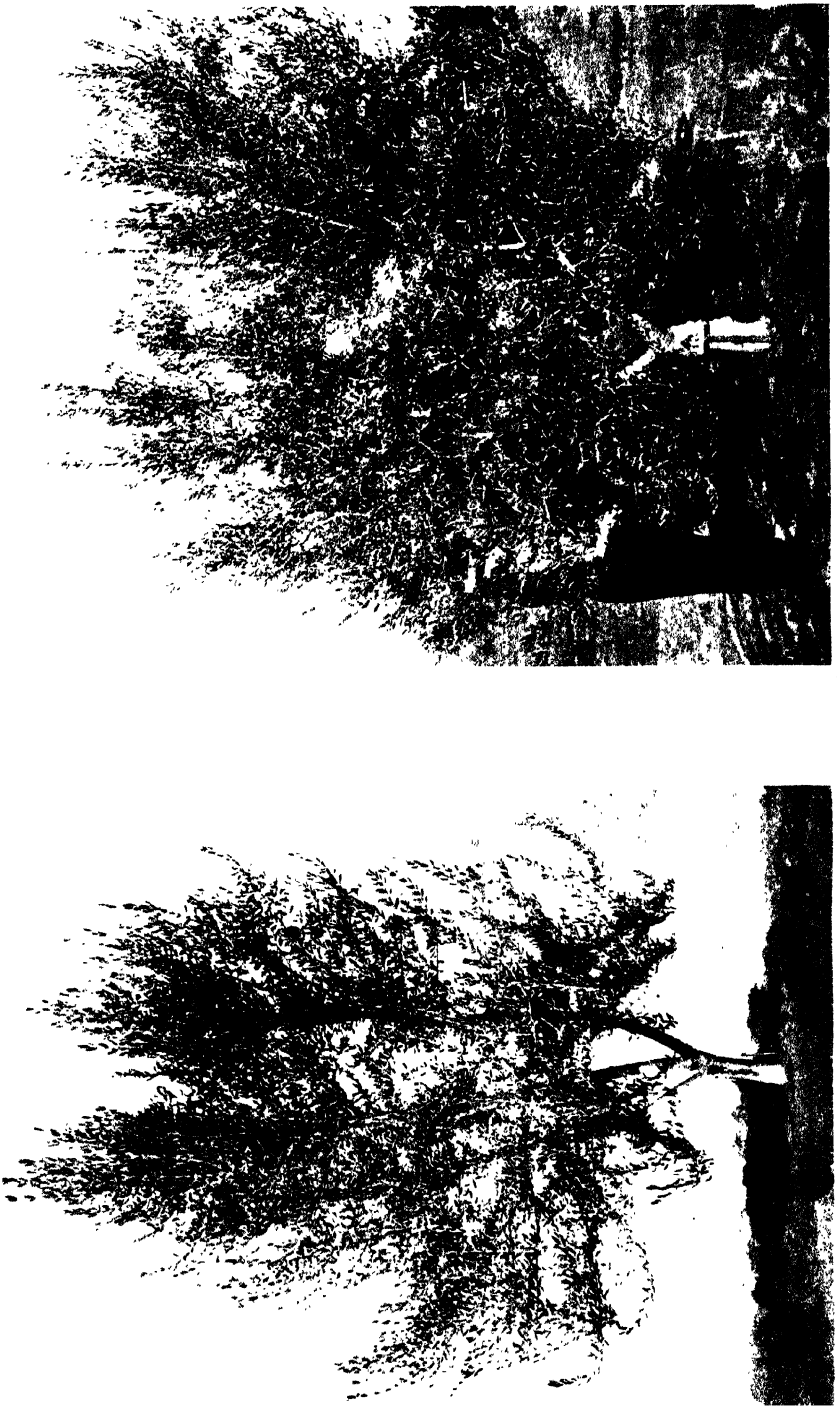
New South Wales seems to be behind either of her sister colonies in this enterprise, and so far little, if anything, has been done in the way of either cultivating the tree or oil-production. This I ascribe partly to the fact that we have not so far opened up any large tract of land in our drier districts such as would be suitable for the culture of this and fruits for drying; however, if we judge by the results obtained by fruit-growers who have a few trees in bearing in many parts of the Colony, this tree is worthy of consideration as one which will yield a profitable return to those who will plant and give it proper attention.

History.

Olive—Olea Europæa.—This well known-plant, which yields the olive oil of commerce, belongs to a section of the natural order *Oleaceæ*, of which it has been taken as the type. The genus olea includes about thirty-five species widely scattered over the Old World. The varieties of olives known to the modern cultivator are extremely numerous, many kinds being grown in all olive-growing countries. None of these can be safely identified with ancient description, though it is not at all unlikely that some of the narrow-leaved sorts which are most esteemed may be descendants of the famed Licinian. The cultivated olive came originally from Asia, and grows abundantly about Aleppo and Lebanon. It is naturalised in different parts of the south of France, Spain and Italy, and found in hedges and woods, but the fruit of that kind is small and of no use. The long-leaved varieties are those chiefly cultivated in the south of France and Italy, while in Spain the broad-leaved varieties are chosen; the fruit of the latter being nearly twice the size of the common olive of Provence or Italy, but the oil is of so rank a flavour as to be almost too strong for British tastes. Among the Greeks the oil was valued as an important article of diet as well as for its external use. The Roman people employed it largely in food and cookery, the wealthy as an indispensable adjunct to the toilet; and in the luxurious days of the latter empire it became a favourite axiom that long and pleasant life depended on two fluids, wine within and oil without.

Pliny vaguely describes fifteen varieties of olives cultivated in his day, that called the Licinian being held in most esteem, and the oil obtained from it the finest known to Roman connoisseurs. The produce of Istria and Bætica was regarded as second only to that of the Italian Peninsula.

In modern times the olive has been spread widely over the world, and though the Mediterranean lands that were its ancient home still yield the chief supply of the oil, the tree is now cultivated successfully



OLIVE TREES AT WAGGA ORCHARD.

in many regions unknown to its early distribution. Soon after the discovery of the American continent it was conveyed thither by the Spanish settlers. In Chili it flourishes as luxuriously as in its native land, the trunk sometimes becoming of large girth, while oil of fair quality is yielded by the fruit. To Peru it was carried at a later date, but has not there been equally successful. Introduced into Mexico by the Jesuit missionaries of the 17th century, it was planted by similar agency in Upper California, where it has prospered latterly under the more careful management of the Anglo-Saxon conqueror. Its cultivation has also been attempted in the south-eastern States, especially in Carolina, Florida and Mississippi.

In the Eastern hemisphere the olive has been established in many inland districts which would have been anciently considered ill-adapted for its culture. To Armenia and Persia it was known at a comparatively early period of history, and many olive-yards now exist in Upper Egypt, where the cultivation is said to be increasing. The tree has lately been introduced into Chinese agriculture; while in the present generation it promises to become an important addition to the resources of the Australian planters. It has also been successfully introduced into many parts of the Cape Colony.

Even when free increase is unchecked by pruning, the olive is of very slow growth, but when allowed for ages its natural development, the trunk sometimes attains a considerable diameter. In the old records one is said to have attained 23 feet in girth, the age being supposed to date back seven centuries. The tree rarely reaches a height of more than 30 feet, many not attaining that height.

It is said that the oil product of Italy averages about 54 million gallons yearly, Spain 150 million gallons, and France 9 million gallons, making a total production of 213 million gallons, of which Italy and Spain together furnish 30 million gallons only for export. It is plain that France is a large importer, almost the entire Spanish surplus and the bulk of that of Italy finding their way into France. The quality of the Spanish product is so poor, owing to the methods employed, that it is nearly all below export grade.

Climate.

As before mentioned, the olive does well in the interior, the heat not having any apparent damaging effect on its success, and it is found doing its best on limestone country. It is dangerous, however, to plant olives in districts where the temperature falls below 20°, as even at this temperature the young wood of many varieties is injured, and should the thermometer fall as low as this in the spring after the tree had begun to grow, the chances are that the crop for that season would be ruined.

Propagation.

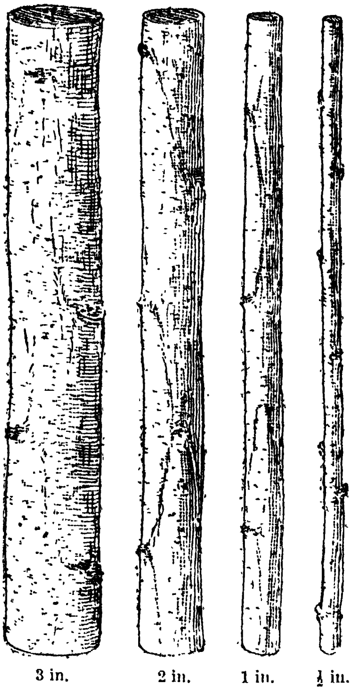
Olives may be raised from seeds, from cuttings, from truncheons, from the tips of the branches, and from sprouts.

If seedling stock is to be raised, save the seeds from the most thrifty trees in the orchard. If seeds of small-growing trees are planted it will be difficult to secure a strong, vigorous growing tree. After removing the seeds from the pulp they should be cleaned by washing them in water containing caustic soda or ashes, so as to remove all oil from them. Then store them away in moist sand until wanted to plant in the seed-bed in the spring. Sometimes the seeds are cracked before planting. This is a slow process, but without this a very large percentage of them will not germinate until the following spring. If the pits are not cracked they may be soaked for twenty-four hours in a solution containing half a pound of caustic soda to 1 gallon of water. This so softens the shell that it will soon decay and allow the seedling to push through.

Seeds should be planted in September in a good sandy, loamy bed in which some well-rotted manure has been thoroughly mixed. The seeds are spread evenly over the top or in rows 6 inches wide, leaving a space of 10 inches between each row for working the soil. Then cover the seeds with an inch of sand, over which spread thinly a little fine manure as a mulch. Keep the bed moist, but not too wet.

After the first season the young stocks may be planted out in nursery rows. The same care should be exercised in planting an olive as with the young orange seedlings. The young roots should never be exposed to wind or sun, otherwise good results cannot be obtained. When the stock is sufficiently large it may be either budded or grafted in a similar manner to any other tree.

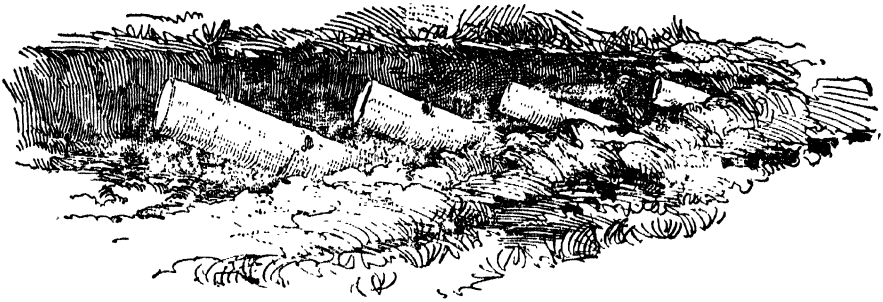
If the trees are to be grown from truncheons, the latter may be taken from the tree in July or August, from branches from 1 to 3 inches through and 20 inches long. They should be taken from healthy trees. Care should be taken not to bruise the bark, and all shoots should be removed. It is well to paint the ends when cut with white lead or Stockholm tar to prevent their drying and decaying. When it is possible to secure good sandy soil for striking, the nurseryman will obtain best results. The method I have usually adopted was to plough


3 in.
2 in.
1 in.
½ in.

Truncheons from ½ inch diameter to 3 inches diameter—all 20 inches long. The 3-inch and 2-inch truncheons are best. The 1-inch does not do so well as the larger ones when planted out in furrows as above, and the ½-inch truncheon is only suitable for striking in the manner described for small cuttings.

Olive Wood used for Cuttings.

furrows at distances of 3 ft. 6 in. to 4 feet apart and plant the truncheons in the furrows at an angle of 45 degrees, thus:—



then completely cover them with soil so that the top is at least 1 inch underneath. After this give them a good watering when it is possible, and keep the land in fine tilth. All the truncheons will not start the first year. These, however, will not die, but will grow the second, and some, perhaps, as late as the third year. From each truncheon from one to four trees are produced, as they throw out roots and suckers their whole length, and these are divided when they are large enough to be planted out in the orchard.

The tops of branches may be taken from the trees in November, when the tree is not growing, or in the winter, when the tops are in good condition. These should be cut about 6 inches long. These cuttings may be taken from any part of the tree, after which they are taken to the propagating-shed and all leaves removed excepting the two or three at the top of the cutting. The lower end of the cutting should be cut off close to the lower buds. The cuttings are then planted in propagating-boxes specially prepared for the purpose—these boxes to be filled with a good sandy loam, and although kept in the shade should be situated in a nice warm place. The boxes should be kept moist be watering daily until the plants are well established, when they may be planted out in nursery rows. Small cuttings may also be struck in a similar manner, taking them from the trees in winter when the wood is well matured. Each cutting should contain from six to ten leaves, all of which should be removed with the exception of the two at the top as soon as they are taken from the tree.

Raising from Sprouts.—The sprouts which may start from the trunk of a tree which has been cut back heavily for the express purpose of forcing out such, may be cut out at the base, taking as much bark and wood with them as possible. These may be planted in specially-prepared beds in the same way as tips. Sprouts may be taken from truncheons when the latter commence throwing out suckers in the same way as they are taken from trees. It has been found that good truncheons are capable of supplying a good many plants for this method of propagation.

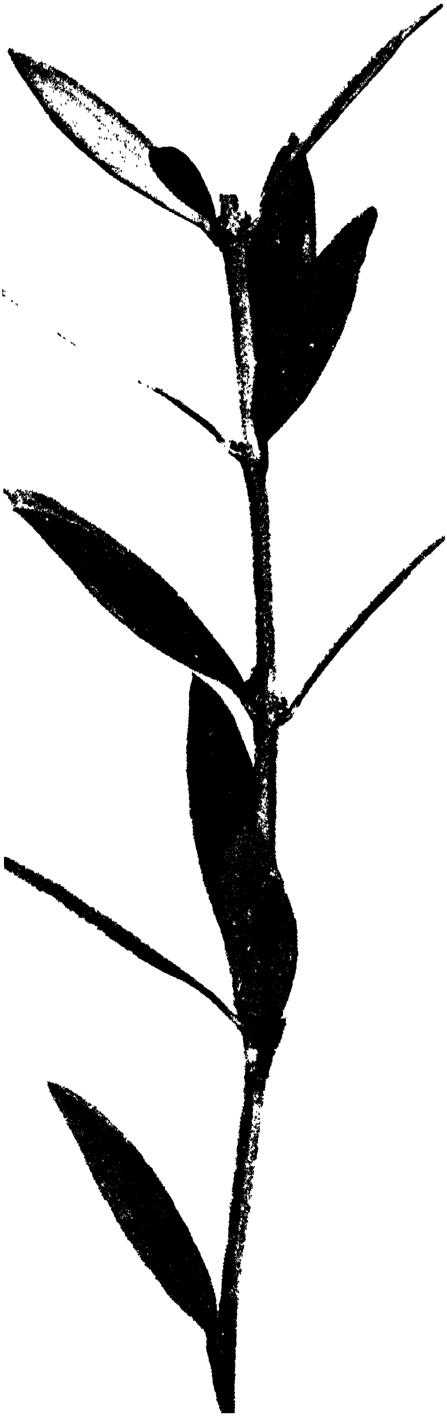
Budding and Grafting.

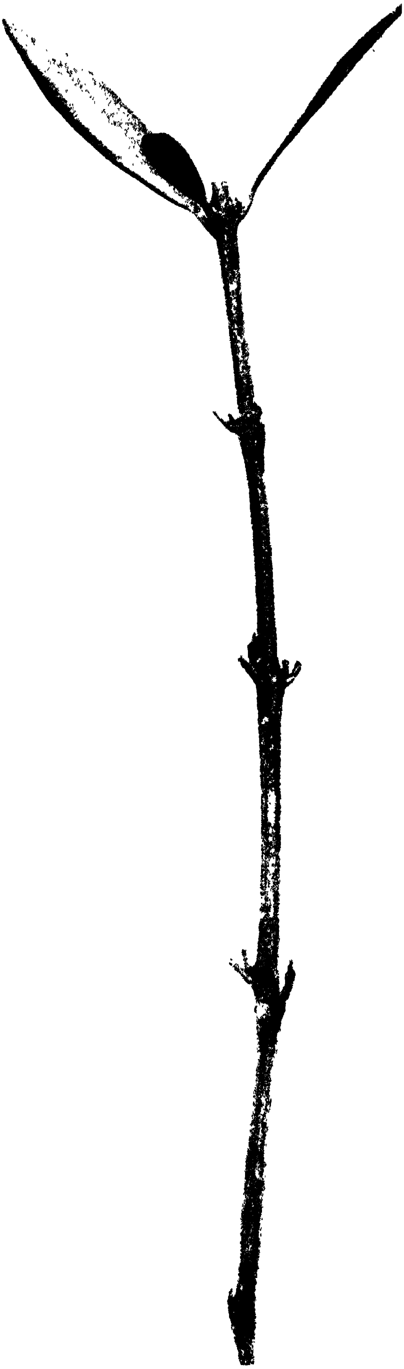
These are the common methods used in working trees of inferior varieties to such varieties as have been found to do best in the particular district in which they are growing, whether for oil-producing or pickling.

I have always advocated budding in preference to grafting whenever it can be done successfully; and we find that the olive can be successfully budded if the work is done in a proper manner, and at the right season. We have found that the spring or early summer are about the best times to work these trees.

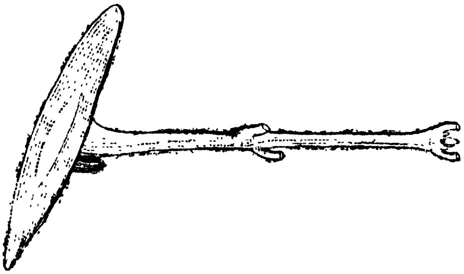
Scion from which buds are taken.

If we wish to work over an old tree we cannot expect to obtain best results unless we cut the tree hard back a year previous to the time of





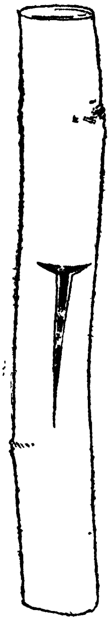
budding. The buds can then be inserted into the young and vigorous growth thrown out by the tree after the pruning. It will be found that there are usually dormant buds in the axil of the leaf as in other plants; but in budding the olive it is usual, after cutting a good large bud, to remove the wood before inserting it into the stock, when it will be found that a much larger percentage of the buds will take. (I do not advocate the removal of this wood when budding nearly all other varieties of trees.) The best results, however, are obtained when twig buds are inserted in place of the dormant bud. In removing the twig bud from the scion or branch a deep cut should be made in order to secure a good large piece of bark. The leaves are removed from the twig and the most of the wood is removed from the bud with the budding knife, which should always be kept very sharp. The twig so left on may be from 1 to 2 inches long. After the bud is in its proper place it should be securely tied with waxed cloth previously prepared for the purpose. (In the *Gazette* for February 1899, in an article on the orange, I explained how to prepare this cloth.) Only those buds which are well developed should be used, and these are always found to be about the centre of the scion. The buds at the base and tip are very often defective, and, although they may grow, they will not make the best bearing trees, and I contend that by taking the best buds out of our best bearing trees we can improve our fruit-trees just as easily as can the stock-owner improve his stock by breeding only from his best animals.



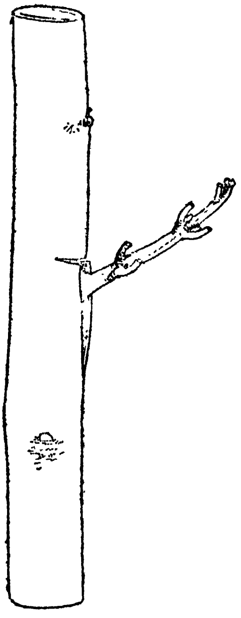
Twig bud, trimmed and ready for insertion - 1½ inch long.

The olive may be grafted in a similar manner to any other fruit-tree, but in cleft-grafting an old tree it is advisable to split the limb on the side rather than directly across the centre. Two or more grafts may be inserted, after which they may be securely tied and the cut waxed over. Should too many start they can be removed later on, leaving the stronger ones to form the future tree. For smaller stocks the ordinary splice or whip grafting may be practised. Care should always be taken to fit the bark exactly on one side, but it does not matter about the other. For small stocks, it is as well to graft low, bind the scion to the stock with waxed cloth, and if planting cover completely over with soil. It is not advisable to work too small stocks, and scions used should not be smaller than a lead pencil.

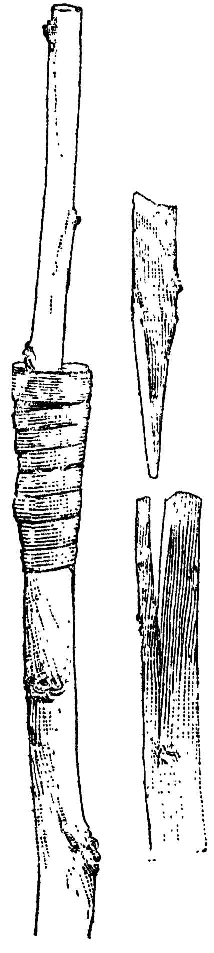
August is about the best month to graft; trees may be grafted later, but the chances are that the percentage of grafts which take will be less than if the work is done earlier.



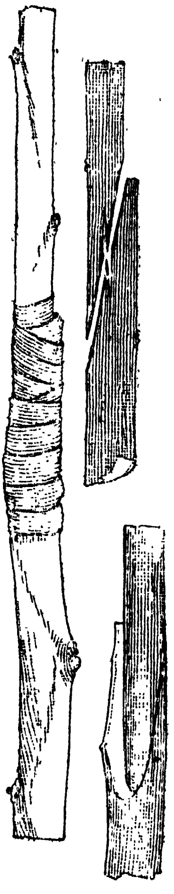
Stock made ready to receive the bud.



Twig bud inserted in stock.



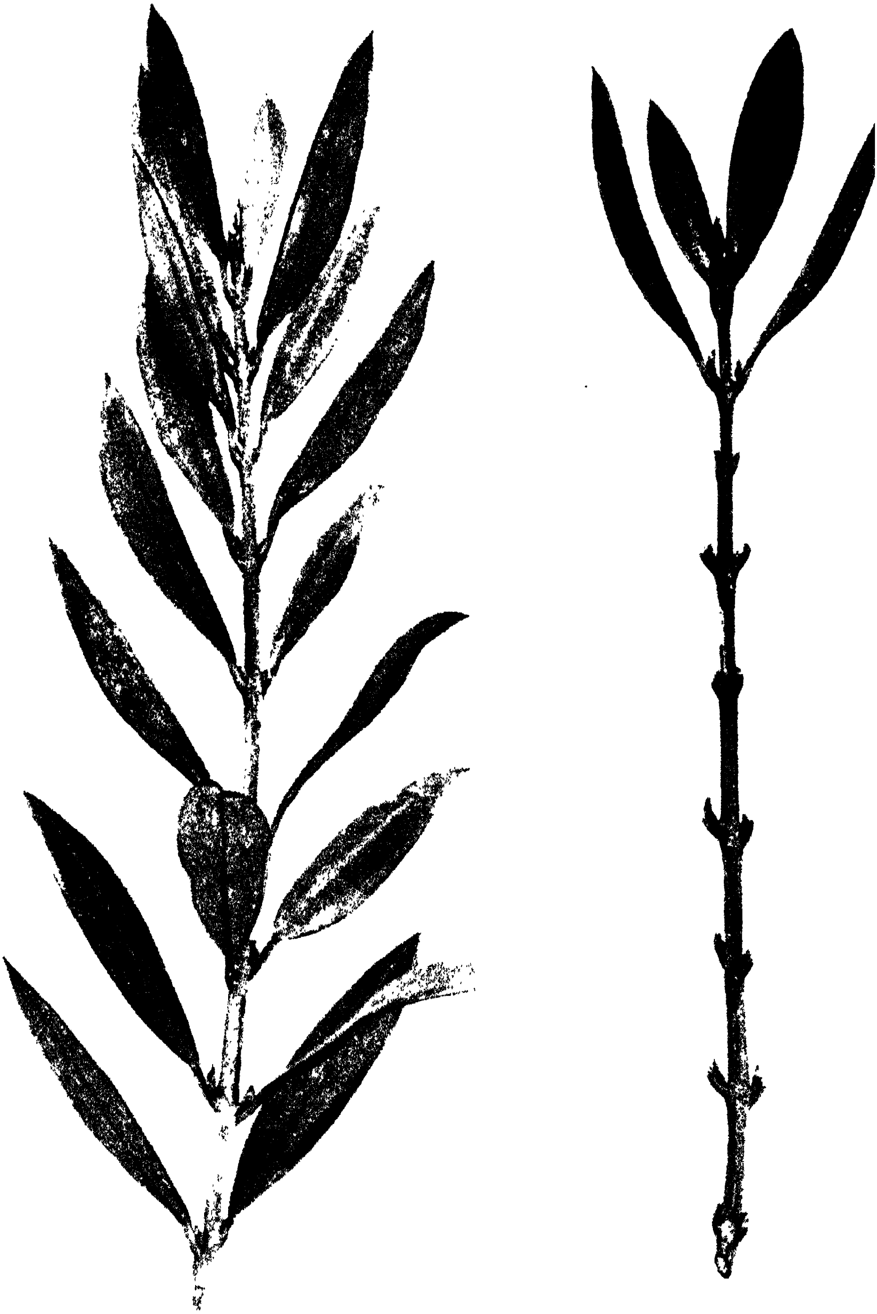
Cleft-grafting.



Whip-grafting.

There are other methods of both budding and grafting, but the two illustrated are what have proved most successful, and require no especial skill to put into practice. It must be always remembered, however, that good sharp tools are always essential for successful work.

(*To be continued.*)



Tip of an Olive Branch used as a Cutting; trimmed for Planting (Nat. size)

Three Important Diseases affecting Sheep: Worms, Fluke, and Foot-rot.

J. D. STEWART, M.R.C.V.S.

In reviewing and supplementing in many directions the information contained in leaflets formerly issued by the Stock Branch with reference to the above diseases in sheep, the avoidance of as much technicality as the subjects would permit of has been observed. The present object is to supply stock-owners with a clear and concise account of the nature of these diseases, the symptoms which become manifest, and the preventive and curative treatment, rather than to attempt anything elaborate.

The chief injurious stomach, intestinal, and lung worms, together with symptoms of the disturbances they give rise to, are described, so that owners may readily recognise their presence and arrive at a correct opinion as to the cause of ill-health and death among worm-infested sheep.

A brief description of fluke and its life-history, together with preventive and palliative measures against infestation, will be found page 841.

The directions for treatment will be found, it is hoped, sufficiently explicit to enable any one to carry them out without difficulty. Treatment previously advised by the Stock Branch, and proved to be effective, is again recommended.

I. WORMS.

Sheep harbour a considerable number of worms. When worms exist in great numbers they give rise to grave constitutional disturbances, often followed by death.

Those most commonly infesting the sheep of this Colony are found in the stomach, intestine, and lungs. Chief among these are the *Strongylus contortus*, *Tænia expansa*, *Strongylus Filaria*, and *Strongylus rufescens*.

A. Stomach and Intestinal Worms.

The *Strongylus contortus*, or stomach worm.—This worm infests the fourth stomach of sheep, where, when sheep are badly infested, it is often found to exist in thousands. Its body presents a peculiar banded appearance of white alternating with dark bands extending from one extremity to the other. When the intestine of this worm is filled with blood recently sucked from the lining membrane of the stomach, the alternating bands are of a brilliant red colour. The body is hair-like, and tapers towards each extremity. The females are from 1 to 1½ inches long; the males are smaller. At a short distance behind the head are two small lateral papillæ, in the form of teeth directed backwards. This worm subsists on the blood it extracts from the mucous membrane of the stomach to which it attaches itself by means of the papillæ. The numerous ulcerations on this membrane indicate the seats of attachment.

The *Tænia expansa*, a tape-worm found in the intestine.—This worm often grows to a considerable length. It is characterised by its yellow, thin, translucent segments, the breadth of which is greater than the length. It subsists at the expense of the host on the chymous matters contained in the digestive canal.

Symptoms.—When these worms infest sheep in numbers, they disturb digestion, and interfere with nutrition. They also produce certain changes in the mucous membrane of the stomach and intestine by the irritation they cause. As a result, mal-nutrition is established, and the infested animal becomes anæmic and easily exhausted. There is evidence of an irregular appetite, and depraved tastes. Marked dulness is also present. The emaciation progresses in spite of abundant alimentation. The fleece becomes weak and dry, and symptoms of disturbed digestion, such as constipation followed by tympany and diarrhœa, become manifest. The scour is often black, and has a scalding effect. In long-continued cases the sheep become thin and "pot-bellied," and are sometimes "bottled under the jaws." Death is commonly caused by debility and exhaustion, although sheep, and especially lambs, often die from convulsions, due to nervous derangement brought about by the gastric and intestinal irritation.

Remedies.—The arsenic drench is used extensively, and has been found to be very effective when repeated for both stomach and intestinal worms. The following is the formula recommended by the Chief Inspector of Stock, *i.e.* :—

The Arsenic Drench.

The proper dose is (say) 2 grains arsenic to a grown sheep, 1⅜ grain to a weaner, and 1 to 1⅛ grain to a lamb.

Arsenic, 1 oz. avoirdupois ...
Washing soda, 2 oz. " ...
Water, ½ gallon ... ...

Boil slowly for half-an-hour until the arsenic is all dissolved; then add water to make mixture up to 1½ gallons. Let it settle, and pour clear liquid quietly off, and bury sediment.

This will drench 240 grown sheep ... ... Dose : 1 fluid ounce.

or

With water added to make 2 gallons of mixture it will drench 320 weaners ... ... Do

or

With water added to make 2¾ gallons of mixture it will drench 440 lambs ... ... Do

The greatest care and exactness should be exercised in preparing the drench. The arsenic should be ordered in packages which do not require breaking or reweighing, and the quantity used should be checked with number of sheep to be drenched. The mixture should be frequently shaken up while drenching.

There are a great number of drenches and proprietary mixtures in use as vermicides. One of the cheapest, simplest, and most effective when repeated, is the turpentine drench recommended by Mr. E. Stanley, F.R.C.V.S., *i.e.* :—

Turps and Gruel.—1 oz. Turps, 2 oz. Gruel.

Ingredients to be thoroughly mixed.

Dose : For grown sheep, 3 oz. ; for weaners, 2 oz. ; and for lambs, 1½ oz. If the sheep are weak the dose to be reduced.

In order to obtain the greatest possible benefit from vermicides, they should be given on an empty stomach. Consequently, it is advisable to yard the sheep over night. The sheep should also be kept from food and water for least three hours after the drench is administered.

B. Lung Worms.

The most common of lung worms are the Strongylus Filaria and Strongylus rufescens.

1. *The Strongylus Filaria* is a thread-like worm, from about an inch to 2½ inches long, with attenuated extremities. The males are smaller than the females. They are found in the bronchial tubes, and the irritation they cause gives rise to "verminous bronchitis."

2. *The Strongylus rufescens* is a very small hair-like reddish brown worm, which in the adult stage inhabits the bronchial tubes. Various forms of this worm are also found in the tissues of the lungs. These worms produce (*a*) lobular pneumonia, when the adult becomes arrested in the bronchial tubes. The lobules usually affected are those about the border of the lungs, and the condition is characterised by the dark red or reddish-brown colour these lobules assume. The affected portions of the lung are consolidated and contrast markedly with the surrounding healthy lung tissue. (*b*) A nodular pneumonia, when the eggs and young worms occupy circumscribed points in the lung tissue. These nodules, which are interspersed throughout the lung tissue, vary in size, from a millet seed to that of a pea, and are usually of a yellowish-grey colour. As they grow old they become gritty, and are often mistaken for lesions of tuberculosis in sheep.

The disease which the above worms give rise to is known as verminous broncho-pneumonia, or more commonly as "hoose." The symptoms are briefly as follows:--a thick abundant discharge from the nostrils, a short, painful, suffocating cough; coming on in fits, especially during movement, a painful difficulty in breathing, great wasting, pallor of the skin, and dryness of the wool. During the spasmodic coughing quantities of mucous are expelled, which often contains great numbers of worms and their embryos.

Treatment for lung worms consists in drenching, fumigation, or intra-tracheal injections.

The turpentine drench recommended for stomach worms has a very good effect, but must be repeated more often.

Fumigation is practised by placing the affected sheep in an air-tight building and liberating the fumes of certain medicines which are inhaled. The fumes liberated by the burning of tar and sulphur masses are very serviceable. To make these masses it is recommended that 4 oz. of flowers of sulphur should be mixed with 1 pint of wood tar, and the paste thus formed thickened up to a mass by adding sawdust or bark. The mass is ignited and placed on the floor of the building where treatment is being carried out. When submitting sheep to fumigation, care must be taken not to push the treatment too far, or the sheep will become suffocated.

The intra-tracheal treatment consists in the injection of certain medicines directly into the wind pipe in the region of the neck. It is the most satisfactory of all treatment for lung worms. A special trocar and syringe is used for injecting the medicine; still, with care, the injection can be made by using an ordinary hypodermic syringe fitted with a curved needle. The following prescription is recommended:—

Take of—	Oil of Turpentine,	15 to 25 drops.
	Oil of Creosote,	5 ,, 15 ,,
	Chloroform,	5 ,, 15 ,,
	Olive Oil,	1 ,, 1½ fluid drachms.

This makes one dose.

The mixture should be well shaken and injected slowly. Sheep badly affected should receive a dose daily for three or four days, after which, at intervals. Two injections, as a rule, check the disease.

Preventive measures.—Attention is directed to the following recommendations previously made by the Chief Inspector of Stock.

1. *General.*

Avoid Overstocking.—It is the opinion of those best qualified to judge, that the spread of the worm-pest is largely attributable to overstocking and the consequent eating out of the most nutritious plants and grasses. Overstocking, therefore, should for this, as well as for other important reasons, be avoided.

A strict watch should be kept.—A strict watch should be kept, especially in a drooping summer season, and if the young sheep show the least signs of ill-health, and if they are not thriving as they ought, one of the most unthrifty should be killed, and a close and thorough search made for worms.

2. *Licks for Sheep.*

Salt Lick.—The best authorities hold that, apart from the question of preventing the attacks of parasites, it pays the owner well to give his sheep all the salt they will take, for it helps to keep the sheep in vigorous health, and he gets a good return in more and better mutton, and more and sounder wool.

Although this is the case, there is no doubt but that the sheep get a great deal too little salt, for, even where salt is given, the allowance is often very short, and a good deal of it is wasted for the want of proper troughs and protection from the weather.

Then, again, some owners give no salt whatever, from the mistaken idea that the pasture on their holdings is of a saline nature, which renders salt unnecessary. This may have been the case in former years, but it is not so now, the pasture in many cases having deteriorated. The best course, therefore, is to try the sheep with salt, and if it is found that they will take it, then they should have an ample supply of all the rock salt they will take with occasional licks of Liverpool salt. The aim should be to find such a lick as will save the trouble and expense of drenching; and there is no doubt but that Liverpool salt is the best vehicle for vermifuges, as well as being otherwise very beneficial as a lick.

Sulphate of Iron and Salt Lick.—Half a hundredweight of sulphate of iron, finely powdered and mixed well with 1 ton of Liverpool (*i.e.* crushed) salt, to be given in weather-protected troughs, constantly available to the sheep, in country at all subject to worms or fluke, and to be given in even sound country, other than the true salt-bush, when the season is such as likely to cause an outbreak of worms.

Turpentine and Salt Lick.—Mix thoroughly 1 pint of turpentine to from 28 lb. to 56 lb. Liverpool salt, according to condition and age of sheep; spread thinly in weather-protected troughs, and give every five or six weeks to the extent (say), 1½ oz. to 2 oz. per sheep, in country where the sheep are liable to worms or fluke, and less frequently in country other than salt-bush.

3. *Burning off the old pasture.*

One of the best means of combating the worm pest and all other parasites, and destroying their eggs, is to burn the pasture. This practice is also beneficial in other important respects—it destroys the germs of disease and improves the pasture.

For all these reasons the practice should, where practicable, be systematically carried out; and it would be so oftener if there were less overstocking, and if timely and effective precautions were taken to keep the fires within bounds.

It will be readily seen that if lambing ewes could be put on burnt feed, not only would the flow of milk be better, but the pasture would be comparatively free from the worms with which the young lambs are so liable to be infested.

If burnt feed could not be got, it would, if practicable, do good to put the ewes on ground where ewes and lambs had not for some time been.

4. *Surface and under draining.*

Surface-draining is very necessary in all the "upland" districts, and also in a great deal of the other comparatively saltless portions of the colony; and, as this can be done at a moderate expense—by running plough furrows, and helping here and there with the spade—the practice should not be neglected; for in country of that description surface water allowed to remain is certain to become breeding-places for the worms and other parasites, besides inducing foot-rot.

This is especially the case with ground over which water from springs spreads. It should be led straight to the creek by means of a shallow surface-drain; and where the surroundings are soft and boggy under-draining should be tried.

This can be done in a cheap and effective way by placing two straight saplings, 8 or 9 inches thick, 3 or 4 inches apart, in the bottom of the drain; then putting a third on the top to keep the other two apart and form an eye, and then filling up with scrub or brush over the saplings, and earth on the top of that.

II. Fluke in Sheep.

Fluke produce, in sheep, the disease known as *Distomatosis or "Liver Rot."* This disease is widely distributed, and often causes great losses. Besides infesting sheep, fluke are found in the ox and pig, and less frequently in the horse.

Fluke (the *Distoma Hepaticum*) are found in the bile ducts of the liver. The mature fluke is flat, and much broader in the middle than at the extremities. As found in sheep, it measures from ¾ to 1 inch long, and ½ to ¾ of an inch broad. Its colour is a slatey-brown.

Life History. The fluke has an interesting and rather complex development and metamorphosis, a knowledge of which allows a more ready appreciation of the preventive and palliative measures recommended.

From the time the embryonic fluke gains access to the liver three weeks elapse before it matures. In another three weeks ovulation commences. Each fluke, it is stated, produces some 40,000 eggs, which may be expelled in the bile, or in the intestinal canal, or after the fluke has escaped outside the host. If the eggs lodge on dry ground they become desiccated and die. But should they be deposited where there is moisture, they hatch out embryos. Warm weather favours the hatching-out process, while a frost will either check or prevent it.

The embryo has power of movement, and its fate depends on it finding its host, an amphibious snail, which usually lives in water holes, creeks, &c. When the embryo meets the snail, it penetrates the system of the snail by means of a special apparatus with which it is provided. In the body of the snail it becomes transformed into a "sporocyst," from which develop other forms—"rediæ." In cold weather each rediæ give rise to a number of "cercariæ," but in moist summer months it transforms into ten or more daughter-rediæ, which in their turn produce as many as twenty-three cercariæ. It is stated that in favourable circumstances a single egg of the fluke may produce as many as 1,000 cercariæ. On the cercaria gaining its liberty from the body of the snail, it swims about in the water with marked energy for some time, and eventually fixes itself on some submerged aquatic herb, blade of grass, &c., and in this position becomes encysted. When the vegetation becomes accessible, either by growth or through the water having receded, the sheep, on eating it, take in the attached cercariæ, which, on reaching the intestine, find their way to the liver, and there develop into fluke, and so complete the life cycle.

The great number of eggs each fluke produces, and the rapid multiplication during development, connotes that a considerable proportion of the eggs and embryos are fore-doomed to destruction. Failure of the eggs to hatch, the embryo to secure the proper host, the sporocysts to develop in the snail, cercariæ to escape and be taken in by the sheep, must cause great destruction. The loss, however great, appears to be adequately counter-balanced by prolific reproduction, which, under favourable conditions, such as heat and moisture, leads to an enormous increase in fluke, when allowed to go on unrestricted. In order to combat this prolific reproduction, preventive measures are suggested which aim at interrupting the life cyle of the fluke by rendering conditions unfavourable for its metamorphosis.

Symptoms.—The effects of fluke infestation vary according to the number of fluke present, the condition of the sheep, and seasonal influences. If the condition of the sheep is good, and they have access to abundance of good feed, they may harbour a number of fluke for some time without suspicion being aroused. On the other hand, a few fluke infesting sheep in low condition may create grave disturbances during unfavourable seasons.

The first effect fluke have when they penetrate the liver is to produce inflammation of that organ. The severity of this condition depends to an extent on the number of invading fluke.

When the number is great, the liver becomes enlarged and engorged with blood. Its texture becomes friable, and is easily broken down; hence the term "Liver Rot." Sheep often die rapidly in great numbers from liver-rot.

If the invasion has not been too extensive and sudden, the irritation the fluke give rise to in the bile canals causes an increase in the flow of bile; consequently, the sheep for the time being thrive rapidly, and the white of their eyes become tinged with yellow. Although the sheep appear to be doing well, it is noticed that they are more susceptible to adverse influences and climatic changes. Owing to the continuous irritation by the fluke, the bile ducts become distended and their walls thickened by the formation of connective tissue (biliary cirrhosis). The growth of this connective tissue progresses at the expense of the life of the adjacent liver cells, that have to do with the secretion of bile. Once the liver cells are destroyed they cannot be replaced, and the organ becomes permanently damaged. If the whole of the liver is involved, the sheep must speedily die; but if it is only partly affected, the sheep may apparently make a good recovery and fatten well, if placed under favourable conditions—such as dryness of pasture, abundance of feed, and an allowance of salt licks One infestation by fluke does not protect sheep from another; consequently, sheep on infested pastures suffer recrudescences until the disease becomes more or less chronic.

As the disease progresses the sheep begin to waste, and become dull and easily exhausted. The conjunctiva, or white of the eye, has now a watery appearance, and may be reddish or injected. In still more advanced stages the sheep begin to purge, and the emaciation going on rapidly, the bones of the back becoming painfully evident. The wool is easily removed, and the eye becomes decidedly watery. The sheep often become pot-bellied. One of the most characteristic symptoms of this stage is the presence of a dropsical effusion below the jaws. This condition is commonly known as "bottled jaw," and is more evident at night than early in the morning. Death, as a rule, takes place quietly.

Sheep infested by fluke often die in great numbers from inflammation of the lungs when exposed to cold winds immediately after being shorn.

Preventive Measures.—These consist in destroying or rendering inoffensive all the ova or eggs of the fluke, the snails which act as hosts, and the cercariæ which infest the sheep.

1. Burn all carcasses of sheep dead of fluke.
2. Remove infested sheep to dry pastures, as the ova they evacuate cannot develop in the absence of moisture.
3. Drain wet and boggy pastures.
4. Burn off pastures.
5. When it can be carried out, the dressing of the pastures with lime and salt is a very effective measure. A ·6 per cent. solution of salt is fatal to the cercaria, a fact which explains the freedom from fluke of many pastures in the Colony.

Palliative Measures.—If sheep must be placed on infested lands, the ill-effects resulting therefrom may be greatly reduced by the following precautions :—

1. Avoid over-stocking. If sheep are compelled to feed on short grass there is more likelihood of their picking up vigorous, though dormant, cercariæ. When grass is allowed to grow a fair length the long exposure to the influence of the sun acts detrimentally to the cercariæ.
2. The allowance of salt and tonic licks. Salt, besides being fatal to the cercariæ, assists digestion and assimilation.
3. When draining is not practicable, all dangerous places should be fenced off.

Treatment.—All the resources of veterinary therapeutics and innumerable proprietary mixtures have been tried against fluke in sheep, but without any really efficacious agent being discovered. This is, no doubt, due to the remote location of the fluke and the structural peculiarities of the liver. Although a cure cannot be established, a great deal can be done in the amelioration of distressing symptoms, keeping the sheep in good condition, and preventing reinfestation by following the above recommendations.

III. FOOT-ROT IN SHEEP.

It is now generally recognised that there are two forms of foot-rot in sheep, *i.e.*, (1) simple or non-contagious; (2) contagious. The former is usually due to mechanical injuries, an excessive wearing away of the horn, scalding or to a breaking of the horn substance. Once the horn becomes broken, micro-organisms gain entrance to the vascular structures, and give rise to the formation of pus, and subsequent disintegration. As a rule, it affects a few sheep in the flock in one or more feet; still, it may be more generally distributed owing to all the sheep having been exposed to the same cause.

Contagious foot-rot, when introduced, spreads rapidly through the flock, nearly every sheep becoming affected. As in the case of other contagious diseases, the affected animals are liable to contaminate the pastures, folds, yards, &c., with which they are brought in contact, and so spread the disease.

Symptoms.—Attention is first directed to the presence of the disease by the affected sheep going lame. On an examination being made of the lame foot the horn is found to be diseased, fissured, and discharging offensive matter. If the disease is far advanced, the whole foot is hot and tender, and the coronet enlarged and painful.

The horn is soft and easily detached. Under the detached pieces there is usually lodged a quantity of foul matter, which has a tendency to burrow under the horn and form sinuses. Often the presence of maggots aggravate the offensive condition. When the sensitive structures of the foot become injured, fungoid growths, which bleed freely when touched, are rapidly thrown out. The affected sheep do not thrive owing to the difficulty they have in moving about and the pain which they experience.

The severity of the disease depends greatly upon climatic conditions and the energetic manner in which it is treated.

Even after foot-rot has been successfully treated the horn becomes deformed, the feet assume irregular shapes, being enlarged, ridged, and often bent.

Treatment.—Treatment must be promptly and thoroughly carried out. When the disease is far advanced, and much of the sensitive foot unprotected by horn, it is a considerable time before recovery takes place. In the early stages it is amenable to treatment, and consequently not so serious.

If the sheep are suffering from the contagious form of the disease, it is advisable to have the treatment carried out as near to the paddocks in which the sheep are grazed as is practicable, so as to avoid any unnecessary contamination of pasture.

As soon as the disease is detected, all sheep in the flock should be carefully examined. Those found to be affected should be placed in a separate paddock for special treatment, while the remainder should be treated with one of the solutions enumerated below as a preventive, especially when they are to be turned out on fresh pastures, as is often considered advisable.

The following treatment for the cure and prevention of foot-rot in sheep, previously recommended by the Stock Branch, has been proved to be very effective, *i.e.* :—

As Curative.

To prepare the feet for dressing, overgrown hoofs should be cut into proper shape by hoof shears and knife. All the loose and diseased horn should be cut away. Avoid cutting into the blood, as the careless use of the knife is likely to increase the troublesome fungoid growths. Carefully remove all dirt, maggots, &c., so as to prepare the way for future healing applications.

1. *Hand Dressings.*

(*a*) Butyr of antimony, with or without an equal quantity of tincture of myrrh.

(*b*) Sulphate of copper (bluestone), 1 part to 4 of water, applied once or twice.

(*c*)	Stockholm tar (not coal tar, which burns the feet)	1 lb.
	Melted fat	2 oz.
	Sulphuric acid	1 oz.
	or	
(*d*)	Stockholm tar	20 parts
	Carbolic acid	1 part
	or	
(*e*)	Stockholm tar	4 parts
	Bluestone finely powdered	1 part
	or	
(*f*)	Oil of tar	10 parts
	Carbolic acid	1 part
	Olive oil	1 part

After a few applications of either of the above dressing, the following powder may be sprinkled on the sores daily :—

(*g*)	Powdered chalk	4 oz.
	Armenian bole	1 oz.
	Charcoal	1 oz.
	Alum	½ oz.
	Sulphate of zinc	½ oz.

When the fungoid growths are excessive, hand dressings *a* and *b* are of great value. Of the two, the butyr of antimony is to be preferred, as it can be more readily controlled in its action. It is recommended that it should be supplemented by dressing *d*, which affords the parts a considerable amount of protection from contaminating influences.

2. *Trough Dressing.*

In using the trough treatment to effect a cure when the sheep's feet have been pared, the solutions recommended below as preventive dressings should be used *once at double the strength there given*, to be followed by others at the strengths given as preventives as often as may be required.

In using trough dressings care must be taken to have the solutions thoroughly mixed before the sheep are put through. Each sheep should be closely watched to see that all four feet have been submerged. Having passed through the trough, the sheep should be allowed to stand in a small yard provided with an impervious floor, so that the excess of fluid which drains off their feet and legs can be collected. It is very necessary to carry this out when arsenical dressings are used, otherwise pastures may become poisoned by the deposition of arsenic from the feet of the dressed sheep.

AS PREVENTIVE.

1. *Arsenic and Potash or Soda.*

½ oz. arsenic. 4 oz. potash or soda. (Potash preferable to soda.) 1 gallon water.

To be boiled slowly for half an hour till the arsenic is dissolved. (This can be done in a 5-gallon oil drum; and one gallon will do about 250 sheep.)

2. *Arsenic and Bluestone.*

½ oz. of arsenic. 2 oz. potash or soda. 2 oz. bluestone. 1 gallon water.

To be prepared as in No. 1.

3. *Bluestone.*

8 oz. bluestone. 1 gallon water.

4. *Carbolic Acid.*

Crude carbolic acid, 1 part. Water, 20 parts.

5. *Wattle Bark and Arsenic.*

A strong decoction of wattle bark, with the addition of ½ oz. of arsenic and 4 oz. potash or soda, prepared as directed, to 1 gallon of the decoction.

These solutions should be used at a temperature between 90 and 100 degrees Fahr.

To give the solution time to do its work effectively the sheep should land on a batten floor, where they should be kept, say, for four hours at least, until the solution has thoroughly dried on their feet; and where a batten floor cannot be got, a good coating of clean straw, or the bark from trees which have been rung, should be laid down in the yard to protect the sheep's feet from wet and dirt.

6. *Slaked Lime.*

Fresh slaked lime is a good substitute for the liquid dressing, if spread on a floor or a thoroughly dry yard, where the sheep can walk on it.

THE BOT FLY.

THIS fly is specially prevalent in the southern parts of the Colony. It deposits its eggs on the breast, shoulders, and forearms of horses which are turned out to graze. The eggs are of a conical shape and yellowish-white colour, and hatch out larvæ after about four or five days. The larvæ cause irritation, and in licking the irritated parts the horse receives the larvæ into his stomach. To prevent this, the affected parts should be smeared with preparations of tar and grease. Oil of creosote and linseed oil (1 of the former to 10 of the latter) make a very effective dressing. Many of the sheep dips diluted with water when used as a wash destroy the eggs and larvæ on the skin. Care should be taken in summer not to apply the smears in too concentrated a form, or they may blister. The presence of a number of larvæ in the stomach may be a cause of indigestion leading to colic of a fatal kind. When once they become attached to the lining membrane of the stomach it is a very difficult matter to remove them by the administration of medicine; but fortunately on attaining maturity after about ten months sojourn in the stomach, they become detached voluntarily.

The Reappearance of the Elephant Beetle.

(*Orthorrhinus cylindrirostris*, Fab.)

By W. W. FROGGATT,
Government Entomologist.

AFTER an interval of ten years, the occurrence of these beetles in sufficient numbers to cause alarm among the orange-growers in the Windsor district, in the same manner as they did on the former visitation round Parramatta, is rather remarkable. Either the pest has been always about during the interval and has escaped observation, which is hardly likely, or else under favourable conditions the beetles appear in great numbers, and attack the orange-trees when their native food-plant is not sufficient for their demands, and this overflow of the beetles from the native forest into the orchards occurs at long intervals. It should be remembered, however, that after one bad visitation the infestation in the following year will probably be quite as bad, if not worse.

Of the native insects that were first noted as orchard pests, this is probably among the earliest, for Olliff says "Scott studied its life-history, and recorded it as an orange-tree pest in 1862."

In the first volume of this *Gazette* (1890), Olliff, under the heading of "Insect Pests," wrote a paper on this elephant beetle, which is illustrated with a very fine coloured plate giving the transformations of the insect, with details of its structure, and a section of an orange-tree showing the damage done by the grubs. These beetles were obtained in an orchard near Parramatta, in October, 1889, where they did a great deal of damage.

Mr. Robert Scobie, of Maitland, has also reported them as destructive to the young foliage of vines in that district. In the February number of this *Gazette*, 1897 (p. 103), and again in the September number (p. 678), I contributed notes in reference to this weevil as a garden pest, of which I give a summary:—

In my garden at Croydon I dug out a large Queensland chestnut tree (*Castanospermum australe*), which was chopped up and left in the wood-house, and the main trunk, being guarled and knotty, remained all through the winter. Early in the following summer I was rather surprised to find some creature was gnawing large patches of bark off the branches of a young apple-tree, and later on caught these beetles clinging round the branch with their long legs interlocked while they were feeding; a few days later I found them treating the young wood of the roses in the same manner, so went round every morning for a week, and collected quite a large number. Clearing up shortly afterwards, a number of circular holes were noticed in the old neglected log, and upon splitting it open I found every inch honeycombed with the tunnels of this beetle in all stages of growth and development, so that my garden visitors were evidently the advance-guard of this happy family. The habit of the adult beetles in eating off the bark of the young wood, though frequently doing considerable damage to the infested tree, also leads to their detection, as the trained eye of an orchardist generally notes the damaged bark, when he would pass by the dull-coloured beetle clinging close round the branch, and perfectly motionless.

This elephant beetle has a very wide range all over Australia, and may be met with in summer upon a number of different trees; but, as far as I know, nothing is known about its particular food-plant in its native state, or where the larvæ feed and pupate. The smaller species (*O. Klugii*), which attacks vines, lives in the branches of dying black wattles (*Acacia decurrens*), from which I have bred numbers. A favourite locality to obtain these beetles in forest country is where a gum-tree has recently been fallen, and a new slip-rail in a gateway, in a similar locality, seems to have a great attraction for them, and they come from all quarters to feast upon the drying bark.

Description.

Briefly described, the colour of this beetle is dark-brown to black, the upper surface covered with small rounded black knobs, which are close and irregular on the thorax, but form transverse ridges down the wing covers, with two raised protuberances on either side of the lower half. In freshly-emerged specimens the beetles are clothed with fine grey and buff scales, which give them a light-brown tint; but as these scales are loosely attached, most of those upon the legs and upper surface are easily rubbed off, and the beetle appears to be of a uniform black colour. It measures slightly over half an inch in length from the tip of the abdomen to the front of the head, not including the long, straight snout *(rostrum)*, which, turned down in front, measures nearly another quarter of an inch

The circular, black eyes are situated at the base of the head, which fits into the short, cylindrical thorax like a ball into a socket; from the eyes to the tip, the snout is slender, with long, elbowed antennae, produced into a club at the tip, standing out on either side. The rostrum is grooved on either side with a parallel cleft running up on either side to behind the base of the eyes, into which the long basal joint of the antennæ fits when the beetle is at rest. The strong jaws, with which this beetle does all the damage, are inserted at the extreme tip of the truncate snout, and consist of a pair of stout horny plates, armed with three angulated teeth on the inner margin, and the short palpi beneath, clothed with fine reddish hairs, assist to draw the food into the mouth. The legs are long, stout, and admirably adapted for clinging to branches, the thighs being swollen in the centre, on the inner edge, into an angular point, and the shanks above the tarsi armed with a stout incurved spine. The fore legs are much longer than the hind pairs; the tarsi, three in number, broad and flattened, broadest to the apex, and fringed with fine hairs, terminating in a pair of tarsal claws. The abdominal portion is nearly three times the length of the thorax, somewhat cylindrical and rounded to the tip, the wing covers protecting the long-pointed, brown, membranous flying wings, which lie hidden and tucked up beneath them when the beetles are at rest.

Egg-laying.

I have several times kept these beetles under observation, but only once succeeded in inducing one in captivity to deposit its egg; this was in a circular hole, about half a line in depth through the bark; but Mr. Izzard, of Windsor, informs me that he has often watched them at work. He says, "They bury their long snout nearly up to the eyes when boring the hole in which they deposit the egg." So each egg is well protected from parasitic enemies and the weather, while the fresh growth of bark soon covers the little scars, so that, except to an experienced eye, it would be quite impossible to say in the spring time whether an apparently healthy tree was infested with these grubs. The eggs are generally deposited some 3 or 4 inches above the ground in the trunk of the tree, but odd ones may reach up to a foot. In the present state of our investigation it is impossible to say how many eggs a single female beetle will deposit in a season, but judging from other allied species I should say about twenty.

Habits of the Larva or Grub.

The little caterpillar in warm weather probably hatches from the egg within a week after it is laid, when it at once commences to feed upon the woody tissue surrounding it, always working in a downward direction towards the roots, packing the gnawed wood and excrement behind as it moves along, so that the gallery is filled with compressed sawdust, which, unlike the galleries formed by our other wood-boring pests, the longicorn beetles, are free and open, the gnawed and eaten wood débris falling out through holes opening through the trunk, so that these weevil grubs are more difficult to destroy.

These burrows never come close to the bark of the tree, generally running parallel to each other in a large trunk that is badly infested, and are somewhat irregular in form; the direction is always downwards, but sometimes the grub makes a short drive, or blind alley, to the side, a few inches or less in length, returning again to the main tunnel and continuing down into the main roots. The full-grown grub takes about a year to develop, those coming from the eggs deposited in October appearing the following year about the same time.

When the full-fed grub has reached the end of its journey down the trunk into the roots, it retraces its path, throwing back all the accumulated sawdust of its earlier labours in the passage it had made the previous season, so that by the time it has reached somewhere about where the egg was originally deposited, it is ready to pupate.

It is very difficult to follow the ramifications of the burrow of one grub where a number are at work and their chambers run beside each other, for there are often a dozen or more at work in the same tree-trunk, not 6 inches in diameter, but some of them extend up to 18 inches or more in length. When they attack nursery stock, sometimes two or three eggs may be deposited in a stem no thicker than one's finger, but usually only a single egg is deposited, and when this is the case, after the beetle has emerged, by cutting down the centre of the stem its work is easily examined. I have one where the grub commenced operations 2 inches above the ground, and followed down into the main root for another 5 inches, leaving a circular hole in the stem about a quarter of an inch in diameter.

Larva and Pupa.

The larva is of the usual short obese legless form of these weevil beetles, of a dirty-white colour, with small reddish plates round the stout black jaws. The body is very much wrinkled, and generally retains an arched position, with the tail curled in towards the head. The larva, as before noted, pupates, as a general rule, close to the bark at the upper end of the chamber, but in some cases they get belated, and have to undergo their metamorphoses some distance from their final goal. The pupa is of the general pale yellow, to semi-transparent colour clouded with brown, somewhat oval in shape, with the snout curved in against the ventral surface. Scott states that the insect remains about eighteen days only in the pupal stage before emerging as a perfect beetle.

Locality Infested.

The district visited is within a few miles of Windsor, and the first orchard examined contained a number of infested trees from ten to fourteen years old, which had been greatly neglected for some years after they were planted, and were in a rather exposed position on a hillside. Several trees that were known to be badly infested had been dug up for my inspection, and were honeycombed all through the roots with these burrows, but only one or two belated larvæ were found; all the others had evidently escaped early last summer. A number of growing trees in the orchard were examined where the circular holes in the trunk, from one to four or five in number, showed where the beetles had emerged; and, though these trees did not appear any more unhealthy than others growing alongside that did not show any traces of infestation, yet it is hardly likely that they would grow large crops of fruit when their roots were half-eaten out.

It is, however, when they attack nursery stock that they are to be dreaded, and one orchardist informed me that he had lost over a thousand stocks the year before, and that they showed a marked preference for seedling orange and lemon stocks; he also said that he could tell any young tree that contained larvæ from the colour of its bark, and that, by pulling up and burning all infested stock and spraying the others with a liberal dose of Paris green, he had cleared them out of his nursery.

Remedies.

The remedies against the cherry-tree borer and the larvæ of certain longicorn beetles that leave an open passage behind them cannot be used against the larvæ of this weevil, for not only does the scar heal up on the bark, but the impacted sawdust in the tunnel prevents the application of kerosene or a bent copper wire.

As the beetles always lay their eggs in the bark on the trunk of the tree within a foot or so of the ground, it would be an advantage to heap the earth up round the trunks of the trees during the time when the beetles are egg-laying—from October to December—and wash the uncovered portion above with carbolic soap wash, or some other offensive-smelling substance that at the same time would not injure the bark of the tree.

Hand-picking all beetles found in the orchard, going round early in the morning and jarring the infested trees after a sheet has been placed under to catch all the beetles that fall can be recommended.

Bisulphide of carbon has been successfully used to destroy a similar grub of the "apple-root borer" (*Leptops Hopei*), but in this case the larvæ feed upon the outside surface of the roots, so that the fumes can reach them; in our case the larvæ, being inside the roots, would be perfectly safe. When once they have gained access to the trunk and the eggs are safely deposited, there does not seem to be any method of eradicating them; but though I do not think that any orange-tree that has been infested with a dozen or more of these grubs will ever do much good if it does survive, yet one that has escaped with one or two would probably recover if not further infested the following year.

DRESSING FOR TENDER-SKINNED HORSES.

HORSES with delicate skins are specially subject to saddle-galls and sore shoulders, when worked to any extent in harness. Much may be done to render such animals less liable to injuries of this kind by the regular use of astringent applications calculated to harden the skin over their backs and shoulders. As dressings for this purpose, quite a number are employed by horse owners in different parts of the country. One of the most popular, and also one of the most effective when properly prepared, is a home-made decoction of oak bark. A brine made of common salt is also very extensively used, and usually with good results. Another excellent dressing, and one which is much easier to prepare than the oak-bark decoction, is a lotion consisting of 2 drachms each of alum and sulphuric acid in a quart of water. The parts which are liable to chafe should be freely sponged over with one of these dressings two or three times a day. After a time, skins so treated will harden, or toughen to such an extent as to give no further trouble.—*Exchange.*

Wattle bark broken up fine and stewed for several hours will make a good substitute for the oak-bark concoction.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director Botanic Gardens, Sydney.

No. 66.—*Chrysopogon gryllus*, Trin.

Botanical Name.—*Chrysopogon*, from two Greek words, signifying "golden beard," the tuft of hairs under the spikelet being sometimes of a golden colour (very marked in *C. gryllus*); *gryllus*, Latin—a cricket. Trinius took the specific name from Linnaeus (*Andropogon gryllus*), but is not evident why the species is connected with a cricket.

Synonym.—*Andropogon gryllus*, Linn., in Mueller's Census.

Where figured.—Duthie (sectional drawing).

Botanical description (B. Fl. vii, 537):—

An erect glabrous grass of 2 to 4 feet.

Leaves long and narrow, with a small ligula.

Panicle loose and spreading, 3 to 6 inches long, of numerous capillary simple branches mostly verticillate, of very unequal length, each bearing a single hermaphrodite spikelet sessile between two pedicellate male ones, with a tuft of hairs at the base of the sessile one and on the pedicels. Sessile spikelet narrow, three to four lines long, outer glumes rigid, acute, five or seven-nerved, the lateral nerves more prominent and muricate or hispid, with a few short conical or rigid hairs.

Second glume narrow, hispid only at the end, the keel produced into a fine straight awn.

Third thin and hyaline.

Awn or terminal glume long, rigid, and twisted in the lower part, the hyaline base narrow, with short lobes sometimes obsolete.

Pedicellate spikelet 3 to 5 inches long.

Outer glume membranous, tapering into a short fine awn, the inner ones unawned.

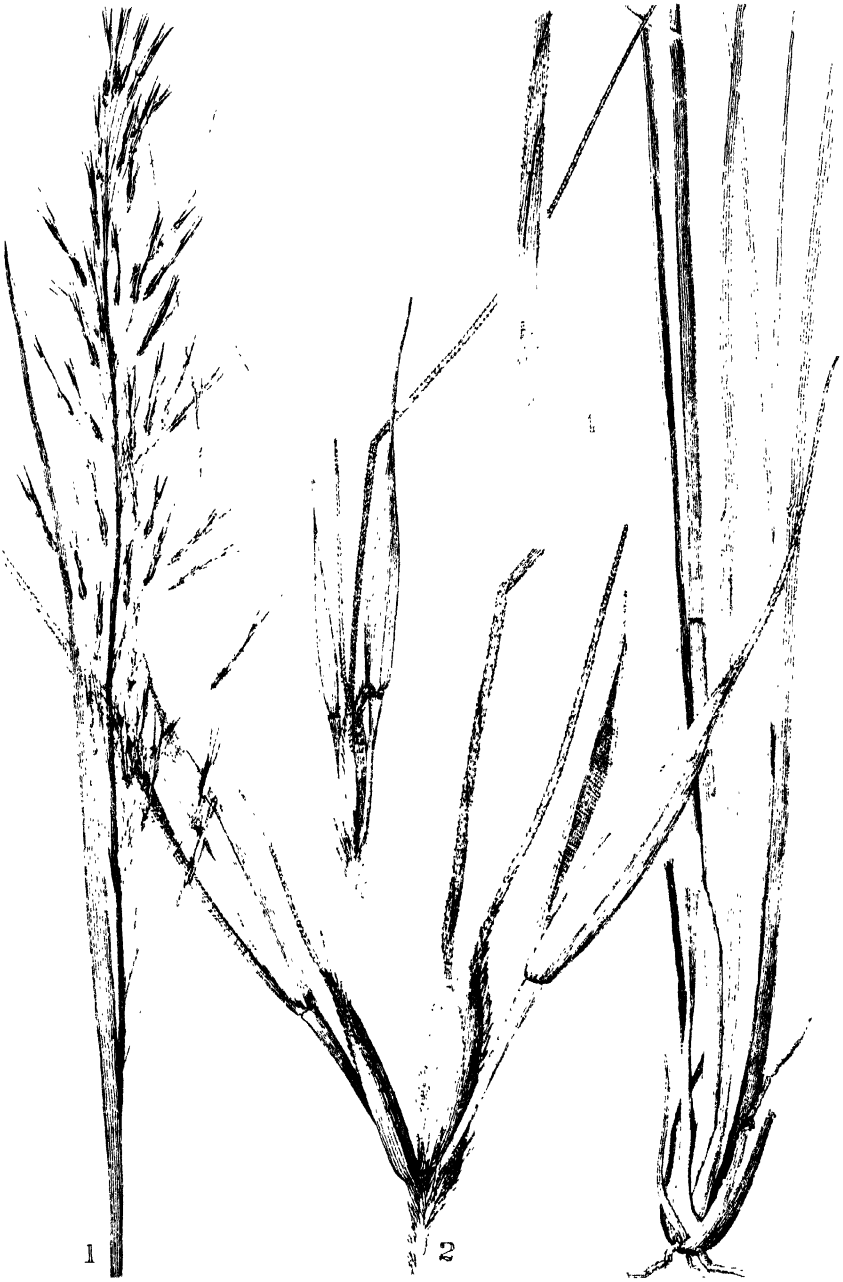
Value as a fodder.—A very good pasture-grass, not, however, abundantly diffused in this Colony. O'Shansey says it improves much under cultivation.

Other uses.—C. R. Dodge (Useful Fibre Plants) says:—"Known in Italy as Barbone and Pollinia. From the fibrous roots horse-brushes and other coarse brushes, mats, etc., are said to be made; also used for thatch material."

Habitat and range.—Found in all the colonies except Tasmania, and extending in New South Wales from the tableland to the interior. It is also found in Europe, Asia, and Africa. In India it is specially found in the hilly parts of North India.

Reference to Plate.

1. Panicle.
2. Part of Panicle (enlarged).
3. Sessile spikelet between the two pedicellate ones.
4. Part of sessile spikelet with base of awn.



CHRYSOPOGON GRYLLUS, Trin

Western Agriculture.

R. W. PEACOCK.

Girilambone District.

The progress of agricultural settlement at Girilambone is of greater interest when the fact is taken into consideration that this district represents the extreme western edge of any systematic attempts by farmers to try their fortunes in combating, without the aid of any artificial systems of irrigation, the inhospitable conditions which obtain throughout the vast area of central Australia. Within the last ten years a number of farmers, principally from the arid districts of Victoria and the Murray in New South Wales, took up land with the intention of combining wheat growing with stock raising, with the result that at the present time from 3,000 to 4,000 acres are under crop. The farmers number about thirty, with cultivated areas ranging from 50 to 500 acres, which comprise but a small portion of their holdings, the remainder being used for stock purposes.

The many difficulties which have been surmounted by these pioneers are only known to those who have undergone them. The initial work of clearing the densely-scrubbed country of the West Bogan; the prospecting for fresh water, which only resulted in the finding of brackish supplies unfit for drinking purposes; the incessant fight with Nature in her most capricious moods; the breaking down of prejudices existing between the large and the small holders; the disadvantages of sparse settlement, and the great distance from market, are but some of the many disabilities under which they have laboured. It speaks well for colonial pluck to find that a larger area is under crop this than any preceding year, after the disheartening returns owing to the droughts of the last few years. Last season little more than enough wheat was grown to re-seed their farms. Such a poor return has not always been reaped, as such yields as seven bags to the acre have been harvested, while for a few years of the early settlement payable crops were gathered; and, although the last few years have not been so satisfactory, the farmers have not lost faith, but are looking forward to the return of seasons similar to the best they have experienced. The prospects for the next crop are decidedly more encouraging, but good spring rains will be necessary to allow of their maturing satisfactorily.

The soil is mostly a red sandy loam, with gravelly ridges and red soil flats, and is typical of large areas of the West Bogan country. Prior to clearing it was heavily timbered with box-trees, pine, and budtha, as well as numerous acacias and other scrubs. Upon the areas not cultivated a fair amount of ringbarking and scrubbing has been done, and to reap the benefit of this work the suckers and seedlings have to be kept in check. The pine scrub is one of the easiest dealt with, as, after ringing or felling, it never suckers, which cannot be said for the box and budtha, they in many instances requiring a great expenditure of labour to keep them in check, the ringbarked box trees in many instances sucker freely, and it is a vexed question as to the best modes of ringbarking and the proper season to do it, to ensure the death of the trees without suckering. When the land is only required for grazing, the bark of the thin growing layer is cut through without removing a chip; in some instances a ring of bark about 6 inches broad is removed, which is preferable. By these methods many of the trees may not die for two or three years. When the land is required for cultivation the bark, growing layer, and sapwood is cut through, cutting a ring out as deep as the darker coloured heart-wood; this ensures their death within a few months, but the stumps are more liable to sucker than by the former methods.

The accepted time for ringbarking is when the sap is up, which is ordinarily in the spring and summer months; but the rainfall has much to do with it. The budtha is not so amendable as the pine and box to this treatment, and clings most tenaciously to life. If the small ones are cut down they invariably sucker, and if taken out by the roots the remaining portions very often grow, but if the larger trees are ringbarked they mostly die outright, and the most effective treatment where feasible is to allow them to grow to a convenient size to ringbark say from 5 to 6 inches in diameter and then deal with them. The numerous seedlings of pine and box which come up throughout the ringbarked country, especially where heavily stocked, require no small amount of labour to eradicate. The pine is easily killed by axe or slasher, but the box seedlings must be removed by the mattock to a depth of very often from 5 to 8 inches, for unless they are cut below what is commonly called the bulb and the first two horizontal roots they are sure to grow again. All this means labour for the holder, for unless the land is thus improved it is worthless, and if neglected reverts, if it were possible, to worse than its former condition. Wherever practicable it is wiser to clear old ringbarked country for the plough, as it is sweeter and enriched by decaying leaves and twigs as well as being more easily and cheaply cleared. The timbers are of such a nature as to burn readily, especially when dry, and no drawing of logs off the paddocks is required. The timbers growing upon the land indicate to a certain extent the nature of the soil, but these indications are not always to be relied upon. For instance, pine grows most abundantly on light sandy flats, but is also found upon ridges and flats of a heavier nature. The mulga and yarren seem to prefer a heavier soil, with a more impervious subsoil, but are also found upon the lighter ones. As a rule, the pine country is more easily cultivated than the yarren country, the latter requiring a lot more cultivation to allow of aeration to ensure the desired mellowness. The intermediate soils ordinarily give the best results. The variety of crops grown is somewhat limited owing to the arid conditions, wheat being the staple product, and is used for fodder as well as grain purposes. A few different varieties of wheats have been tried, the majority of farmers preferring the purple straws, they so far proving the most suitable. Oats have been grown for hay under favourable conditions, but cannot be considered as drought-resistant as wheat under ordinary conditions. Maize for green fodder has been attempted with only partial success. The summer months prove too dry for the cultivation of many of the crops under cultivation in more favoured localities. No systematic experiments have been as yet carried out in the district itself, but it is probable that certain varieties of many cultivated crops that are now being tried at the Coolabah Experimental Farm may be found to adapt themselves moderately well to the conditions of the country about Girilambone.

THE POTATO SCAB.

THERE are few problems connected with potato culture that engage the attention of the farmer as much as potato scab. Of late this disease has assumed serious proportions, and in some instances has caused the loss of almost entire crops. To those who have had experience with the disease its nature is well known. It is essentially a skin disease of the tuber, and is caused by a specific germ found in the soil. How to overcome the disease has been a study of many investigators, and after six years of careful investigation Dr. Halsted, of the New Jersey experiment station, lately published his results in special bulletin 8 of that station.

Of the sixteen different remedies tried for the disease, including various substances for soaking the seed, he finds sulphur to be the best. It is surer than other remedies, because it can be put in the ground as well as on the seed. The seed potatoes may be soaked in formalin or corrosive sublimate, and yet the crop may show a large per cent. of scab. This is because the soil itself was badly infested with the scab germs. Dr. Halsted found that the scab germs remain in the soil for more than six years. Clean potatoes planted six years after the previous crop were found to be affected with scab. The sulphur may be applied directly to the seed, and also in the drill for disinfecting the soil. For practical use 300 lb. of sulphur will be required to the acre, at a cost of between £3 and £4 in New South Wales.

Not all varieties are alike susceptible to the disease. According to experiments the order of susceptibility is as follows:—Early Rose, Delaware, June Eating, Queen, American Giant, Rural Blush, R.N.Y. No. 2. It is claimed that of the plants that have a tendency to carry the germs of the disease, beets, turnips, and radishes are the most pronounced, and Dr. Halsted advises against following these crops with potatoes.

Seeds and Seed-testing.

C. T. MUSSON,
Hawkesbury Agricultural College.

In almost any given sample of seed, no matter how carefully it has been raised and saved, there may be a proportion of seeds that are not capable of reproducing a plant. A few perhaps have not ripened; the germ in others may have been destroyed by disease or injury of some kind; while, as in some species such as the onion, the duration of vitality of the germ is limited to one or two seasons.

By systematic seed-testing we are able to find out *before sowing* what proportion of the seeds to be used are likely to germinate. Then due allowance can be made for infertility, and loss through resowing the area or shortage in crops, on account of useless seeds may be avoided.

The "Gazette" on Seed-testing.

The Department of Agriculture has not been unmindful as to the importance of this subject, as all regular readers of the *Gazette* will admit.

In 1898 (*Gazette*, June, 1898, Vol. IX, p. 700), the Principal of this College issued a notice that seed would be examined, tested, and reported upon, if sent for the purpose. This offer holds good in the present and for the future.

In *Gazette*, 1891, Vol. II, p. 139, there appeared an article on the Purity and Vitality of Seeds. It pointed out "that seeds (except as regards larger sorts), are rarely sold entirely free from an admixture of weed seeds. Most of the weeds now so troublesome in our cultivated fields are European plants, originally introduced, and widely disseminated in packages of imported seeds.* Whilst the entire exclusion of weed seeds from packages of small seeds is not to be expected, the farmer is justified in demanding that the real worth of the seeds he purchases shall come up to a reasonable standard. Both gardeners and farmers who purchase seed at unreasonably low prices are to blame. The Royal Agricultural Society of England has established the following standard for purity and vitality:—

1. 95 per cent. by weight shall be true to name.
2. Pure seed shall germinate not less than 90 per cent. in clovers and cereals, and 70 per cent. in grasses."

Apparatus for testing is described.

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* At present time we have a consignment of glass beakers packed in hay (presumably English); from it thirty different plants and fifteen different kinds of seed have been taken, many of the latter still retaining their germinating power.

In Vol. x., 1899, p. 329, there appeared a further article dealing fully with the testing of seed for germination (taken largely from the U.S. Annual Report). Illustrations and considerable detailed information were given, quite sufficient to enable any person to take the matter in hand intelligently.

Other articles deal with seeds from other points of view, *e.g.*, Vol. ix., February, p. 183, treats of the advantage of using large seed. In Vol. viii., December, p. 855, Dr. Cobb also deals with grading of wheat-seed.

Seed-work at the College.

A considerable amount of practical work in seed-testing, in addition to special lectures, is done at the College, students assisting; all the seed used here may now be said to be put through a laboratory test. We try to impress on students the importance of buying *good seed*, and of testing it carefully. Universal demand for good seed would soon stamp out all that is inferior, for which there should be no place in our markets.

The Principal is at one with me in desiring that every advantage should be taken of our offer to examine, test, and report upon any seed sent for examination; such work would provide further valuable training for students in this line.

The Farmer's proper attitude in regard to Seed-testing.

Farmers would save considerably in the long run by purchasing good seed. Many admit this, but in large seedings money considerations often stand in the way. Such seed gives larger returns, the resulting product would be superior, all the ground would be utilised, blank spots would not occur, so there would be no patches of bare earth to give weeds their opportunity.

To protect himself every farmer should examine all seed and test it before planting; many recognise the importance of this and do it, but by far the larger number just leave it alone. The immediate result of a test enables us to supply any deficiency in the germinating percentage by increasing the amount of seed to be used—a most important matter, which would often save much disappointment in the matter of short crops.

Seedsmen have in the past, and do at present, advise the use of good seed; they prefer selling seed that can be recommended, but they can hardly be expected to guarantee the crop.

In Europe many experiment stations hold control contracts with seed merchants for testing purposes, and a certificate of test is then put before buyers along with the samples.

It may be pointed out, what many do not recognise, that seeds when sown are more frequently than not under very artificial conditions, even if the greatest care be used, and consequently may not come up as we expect; not, however, necessarily, through any fault of the seed. For instance, thick-skinned seeds are often planted without any preliminary soaking in water; this is a mistake. All hard-skinned seeds, nay, *all* seeds germinate more readily after having been put in hot water (hard seeds will stand it boiling) and allowed to stand for a few hours; a difficulty in the way is that wet seeds are difficult to handle, especially in drilling machines. No ill effect would result if, after soaking, the outer skin of seed be carefully and quickly dried; the germ, however, must not be allowed to harden and become dry.

Again, the seedling is killed by many artificial manures if they are not thoroughly mixed with the soil. A field of pumpkins came to nothing, because each seed was placed *on* a handful of kainit.

Acclimatized seed is, speaking generally, better than introduced seed. We grew here, some years since, lucerne, the seed imported from U.S.A., Hungary, and England, alongside Hunter River and another acclimatized variety; the two latter were greatly superior in growth to the others.

Then, again, seed from immature fruit, although giving early results, gives smaller and weaker crops. Seeds also vary very much in size, more than is thought to be the case; grading out all small seed as a regular thing, only using the larger seed, would improve returns. It has been shown (Proc. Am. Assn. Ad. Sc., 1895) "that if large seed of radish is used about 90 per cent. of crop reaches marketable size; if mixed seed be used, or seed as it usually comes to market, only about 45 to 50 per cent. becomes marketable." Grading would dispense with, in wheats, for instance, from 2 to 10 per cent., and in some few varieties, 20 per cent. of small seed and rubbish. Constant selection, by grading, of large seed for sowing, would gradually reduce the amount of small grains produced, and during the process all weed seeds would be removed. Grading should be done as a regular thing; just as surely as the seed is sown it should be graded before sowing. Under the smaller quantity of seed sown (consequent upon the removal of small stuff) quite as heavy a return would accrue, if not heavier, and the harvested grains would be on the whole larger, for "like begets like."

Change of seed, with rotation of crops, are absolutely essential; though frequently, even in these days, often not considered, and any loss blamed to the seed.

No matter what trouble and expense we go to, unless the seed be good, we get poor returns, and if anything can be done to improve the seed, or point out before sowing that it is poor, we must be the gainers.

Testing Seed.

Supposing the seed to be genuine (*i.e.*, correct as to name—an important matter), for all ordinary practical purposes it can be tested for

1. Purity,
2. Vitality,

with but very little trouble. For agricultural seeds vitality and purity are chiefly important. For garden seeds, vegetables and flowers, perhaps the main consideration is that they shall be of good stock and true to name.

Testing for Purity.—To arrive at an accurate estimate a fair sample of the bulk must be obtained. Some should be poured into a basin or bowl, and thoroughly mixed; it should come from top, middle, and bottom of a bag, or a little from each of several bags. From this mixed sample a small quantity should be taken and spread out on a sheet of paper; with the naked eye, or a small magnifying glass, the presence of weed or other seeds and refuse can readily be detected. Such should be removed, and the quantity estimated; weighing is the most accurate method. Cases are known where in a sample of grass seed purchased not a single seed was true to name; it contained four other kinds, one a noxious weed. Oats, too, are of frequent occurrence in our wheat crops; this is the case near Yass, and is a serious trouble. We get dodder in lucerne; and in two samples of wheat recently examined at the College, one contained darnel in considerable quantity; the other, seeds of eight different kinds of weeds.

The necessity for cleaning by sifting is thus clearly proved.

Testing for Vitality.—Proceeding with our sample:—Seed that is apparently sound should be carefully examined as to colour, plumpness, and brightness; these are important points in the matter of judging age. Old seed becomes dull and shrivelled, losing colour; and the older seed becomes the weaker its germinating power. As the result of a long series of experiments relating to the age of seed, made in America, the average of twenty kinds of seed under a vitality test reads:—

Age of Seed.	Mature.	3 years.	5 years.	7 years.	9 years.
Per cent. germinated	74	65	45	35	30

Many were worthless after two years.

With few exceptions, then, fresh seed is decidedly the best. The plan adopted here to test for vitality is roughly as follows, varying slightly for different seeds according to size:—100, if large; 200 to 400, if small. Seeds are counted as they fall from a spoon dipped in the sample. There is no selection or rejection made; all are taken as they fall, so as to get all kinds, large and small, broken and perfect. These are placed on damp blotting-paper laid on damp sand or sawdust in a soup plate; a paper label, with pencil writing, is put with them, another sheet of damp blotting-paper covering them, the whole protected by another inverted plate. White flannel may be used, soaked in water. Grass seed is best tested on damp sand, and requires special care in selecting real seeds, discarding all empty glumes. This is easily done by placing them on a sheet of glass and holding it up to the light; good seeds will appear opaque..

The plate should be kept in a safe place, and examined every second day; water must be supplied when necessary, as, especially in hot weather, there is much evaporation. In fourteen days the test should end; but many seeds will not germinate in that time, and tests should be kept some reasonable length of time to give them a fair chance, the surroundings being kept favourable. We have had tests in progress here for months.

All seeds will germinate more readily after being soaked in hot water. The best temperature is from 80° to 85° Fahr. Ordinary indoor temperature answers very well so long as they do not drop below 55° or 60° Fahr.; below that, germination is very slow. Sometimes it is convenient to use an incubator. Seeds must have sufficient heat and moisture, but not too much; these are supplied when required. They also require air. Sufficient circulation is, however, caused when we examine the tests; moreover, seeds germinate best in the dark.

Trouble may be experienced from the growth of mould. To prevent this, all dishes used should be washed in boiling water, and flannel boiled after each test.

We must not forget that conditions in a home test are not the same as when seeds are sown in the field. We may get very contradictory results in the two cases; commonly, however, satisfactory explanations are forthcoming. We had here a lupin plot, which, failing germination, was resown. Some of the seed was tested, giving 75 per cent. fertile; the seed required hot-water treatment. Again, *Lotus tetragonobolus* failed to come up; tests proved the seed good, and, given time, the seeds germinated well. Or seed may be planted before soil is warm enough to germinate. Tobacco and melons require a much warmer soil than cereals, for instance. Seed lying long in the soil is at great risk, and poor results may accrue.

When observations commence all germinated seeds should be removed, counted, and the results carefully recorded in some book kept for the purpose. Below is given a plan for headings for such a book; only a few pages would be needed, so there would be little trouble in ruling it. Such records might not be complete for some time, and are always useful in after years for purposes of comparison. In the case of mangel and beet, the roots should be allowed to grow for a few days, then counted, cut off, and removed, leaving the seed for future observation, as 100 beet seeds should produce 150 seedlings.*

Appended is a provisional table showing standard percentages; unless the seed germinates somewhere near the figures given it is not good.

Insects in Seeds.

Many seeds, especially legumes (bean, pea, etc.), are found to contain weevils or other insects in some stage of life. Seed is frequently so much damaged as to render germination very weak, or prevent it altogether. We had a plot of beans fail from this cause. The presence of such pests may be detected by examination; small circular depressions indicate presence of weevils. On steeping in water, any floating seeds may be suspected, though they do not necessarily always fail to germinate. To kill such pests, steep seed in water at 135° Fahr.; or expose to fumes of bi-sulphide of carbon (CS_2) in an air-tight box. The vapour is explosive, so care has to be exercised in using it.

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* Pieters.

Treatment for Fungus Pests.

Steeping all seed in hot water (135° Fahr.), in which bluestone (sulphate of copper) has been dissolved (1 oz. to 100 oz. water), might be done with advantage. Whilst it would not affect many parasitic pests, it would kill any fungus germs (spores, which act for fungi as seeds act for flowering plants) attached to the seeds. Such germs can only be detected with the help of a microscope; their presence might be taken for granted. Bluestone, if used stronger, has a tendency to weaken the germ. It is safe to sprinkle a little lime over seed that has been thus treated.

Lessons Learned from Seed-testing.

There is one more aspect of the question worthy of short consideration. Adopting a regular habit of seed-testing brings the operator into touch with the importance of harvesting seed in first-class condition, so far as is possible to ensure its being ripe, clean, and pure. Such a frame of mind must be distinctly beneficial; the seed-tester proves for himself the benefits that follow use of good seed, and this must necessarily cause him to exercise the greatest care in any harvesting operations he may carry out.

Much seed is at present saved in quite a haphazard fashion. It rests with buyers to remedy this. There are difficulties to contend with; for instance, experience is necessary in judging as to fertility of grass seeds. Mr. Valder states that out of some hundreds of packets of native grass seeds received at Wagga, the bulk consisted of empty flower heads. Doubtless our variable seasons and the nature of the climate will cause seeds not to set well at times. Seeds in our dry regions have a poor chance of germinating except in favourable seasons, which only occur occasionally; therefore, if great quantities of seed were produced each year, the waste of energy would be tremendous. As it is, in most of our native grasses only a little is produced at a time, enough to catch the favourable chance if it occur; whilst the loss in bad times, through seeds coming to nothing, is comparatively light. In such cases the perennial habit must be strengthened.

Again, seeds of pumpkin, melon, and related plants are often saved without much regard to selection, except with regard to size of fruit kept for seed purposes. All cucurbit seeds should be washed in water, and only those that sink retained; all floating seeds should be discarded.

We may conclude by saying that seed-testing provides a wholesome lesson, in that it proves we should do as we would be done by, brings us closer into touch with the circumstances surrounding the seeds sown; it taxes our ingenuity in order to overcome adverse conditions, and catch hold of all that are favourable. Undoubtedly, year in year out, a close attention to this question would save us money and prevent loss in crops; whilst it would be a potent factor in that important work of selection towards the best ends that all growers, consciously or unconsciously, are aiming at.

Plan for ruling two opposite pages in book for tabulating results of seed-testing. This enables us to use plenty of space and fill in the most important details.

Left-hand page.

Name.	Obtained from—	Year grown.	Test commenced.	Vitality.										
				Examined										
				May 31	June 1	June 2	June 4	June 5	June 6	June 7	June 8	June 9	June 10	June 11
Algerian Oats.	G.C. 28/5/1900.	1899.	May 28.	6	9	31	46	1	0	1	0	0	0	1

Right-hand page.

Standard.	Per cent. Ger.	Remarks:—Purity, actual crop results, &c.
95	95	Fair Sample, size variable. Temperature 60. Method: wet blotting-paper.

Table showing Germination Standards and Results obtained at Hawkesbury Agricultural College.

	Standard.	Per cent. obtained at H.A.C.		Standard.	Per cent. obtained at H.A.C.
Beans	95	97	Grass (*continued*)—		
Beet	150	66	Timothy	90	77
Burnet, sheep's	90	92·5	Kangaroo (Native)	...	7½
Cabbage	95	97	Hemp	...	24
Cauliflower	85	...	Linseed	95	...
Carrot	85	...	from Italy	...	90
White Belgian	...	46	do Sydney	...	92
Intermediate	...	63	Lupin—Yellow	90	75
Cereals—			Lotus tetragonobolus	85	73·5
Wheat	95	98	Mangel—		
Barley, Cape	95	99	Red	150	64
do Skinless	95	98	Yellow	150	34
Oats—			Millet	85	...
Algerian	95	95	Onion	85	27
Black Tartarian	90	83	Parsley	75	...
White do	95	100	Parsnip	75	...
Dun	95	93	Hollow Crown	...	28
Maize	92	96	Pea	98	...
Rye	95	97	Tangier Pea	98	94
Clover—			Cow Pea	98	99
White	85	75-97	Radish	95	96
Crimson and Red	90	96	Rape	95	...
Alsike	85	80	Dwarf Essex	...	99
Japan	76	...	Sorghum	90	...
Bokhara	...	8	Kaffir Corn	...	28·75
Cucumber, Melon and Pumpkin	92	...	Sainfoin	85	65
Grass—			Sunflower	90	...
Canary	90	90	Sugar Beet	150	66
Cocksfoot	80	40-49	Tobacco	88	...
Rye	85	50-57	Tomato	90	...
			Turnip	95	...

*(Compiled.) Based on Fresh Seed, *i.e.*, not more than one year old (carefully saved).

Strong and Weak Flours.*

By F. B. GUTHRIE.

In the selection of a flour suitable for baking, there are three points that demand particular attention, viz., the gluten-content of the flour, its strength (that is, its capacity for absorbing water), and its colour. In a good baking flour all these points must be satisfactory. The elaborate analyses of flour and wheat one may still meet with in books and trade journals are valueless to the baker, as they afford him no information as to the probable behaviour of the flour on baking. If he knows the gluten-content, the strength and the colour of his flour, he is in possession of information directly bearing upon the baking quality of the bread, and which enables him to form a pretty correct judgment as to the nature of the loaf he will obtain. I will deal with these characteristic properties seriatim, and show in what manner they severally affect the nature of the loaf, and also how a baker may readily make the tests required for himself.

Gluten.

Gluten is the more or less sticky, elastic mass which is obtained when the dough made from wheaten flour is thoroughly washed in water with continual kneading and working with the fingers until the starch is entirely removed. It is owing to the presence of gluten in wheat that we are able to obtain a dough fit for baking from wheaten flour. Owing to its sticky nature when moist, gluten acts as a binding agent on the particles of flour. With starch alone no dough is obtainable.

Determination of Gluten.

In actual practice the following are the details of the method adopted for the determination of gluten in flour: 10 grammes of flour are made into a fairly stiff dough with a little water. The lump of dough is allowed to stand covered with an ordinary glass tumbler for one hour. It is then kneaded with the fingers under water in a thick-walled glass apothecary's mortar, the water being poured off and fresh added as long as it becomes milky. The advantage of using a glass mortar is that you can see what is going on. You can thus detect the slightest milkiness in the water, and you can detect any stray pieces of gluten that may possibly become detached during the operation. Having washed the gluten thoroughly, it is placed in a small porcelain or glass basin (the weight of which is known) and dried at 100° Cent. (212° Fahr.) for three hours in an air oven. After this time it is again weighed, and the original weight of the basin being subtracted, the remainder gives the weight of *dry* gluten in 10 grammes of the flour. Multiply by 10 and you get the percentage. Gluten should always be weighed dry, and the results given in percentages of dry gluten.

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* A lecture delivered before the N.S.W. Master Bakers' Association, 14th Aug., 1900.

What is Gluten?

Gluten belongs to the same class of bodies as egg-albumen (white of egg), meat-fibrin (muscle of meat), and casein (curd of milk), and has the same or nearly the same chemical composition. These substances are known as "Proteids," and are an essential part of our food. They differ from the other substances used as food in being nitrogenous, and are the flesh and muscle forming part of our food. Food must consist of certain ingredients, viz., proteids (nitrogenous matter), carbohydrates (starch, sugar, &c.), fat, and mineral matter (salts, &c). Besides this, these ingredients must be present in a certain ratio, that is to say, for every 5 parts of starch, sugar, fat, &c., there must be 1 part of proteid matter. If we now examine the following table, which gives us the average composition of flour and bread, such as we consume in Sydney, we find that this proportion is not maintained.

Average Composition of Flour and Bread.

	Flour.	Bread.
Water	12·0	40·0
Fat	1·0	1·0
Ash	0·5	1·0
Gluten	11·0	8·0
Starch	75·0	50·0
	100	100

The ratio in the case of bread is 1 part proteid matter to about 6½ carbohydrates instead of 5. In other words bread is not a complete food in itself; it is too starchy. In order to consume the proper amount of proteid matter to form flesh, repair the waste to tissue, &c., a man, if he ate nothing but bread, would overload himself with starch. Hence the gluten is the most important constituent of a flour, and the nutritive value of the loaf depends directly upon the amount of gluten in the flour. A flour rich in gluten yields a nutritious loaf, and one in which the proper proportion of nitrogenous and non-nitrogenous material is as nearly as possible maintained; a flour low in gluten yields, on the other hand, a starchy, innutritious loaf.

Strength.

The strength of a flour is its water-absorbing capacity, and is expressed in figures which give the amount of water in quarts which a 200 lb sack of flour will take up to make a dough of a given consistency. This property varies very considerably in different flours, and is of the greatest importance in determining the baking value of a flour.

Determination of Strength.

The strength of flour is determined as follows:—1½ oz. of flour are placed in a capacious flat dish (a photographic dish is convenient), and water is added from a graduated burette, the flour being kneaded into a dough. When all the flour is made into dough, the addition of water is continued gradually, in small quantities at a time, the dough being well worked between each addition. This is continued until the dough, when tightly squeezed in the palm of the hand can no longer be cleanly removed with the other hand—in fact, until it has become just unworkable. By taking a properly graduated burette the amount of water in quarts may be at once read off.

Relation between the Strength of a Flour and Amount of Bread Obtainable.

Obviously the figures given for strength can be translated so as to show approximately the amount of bread obtainable if allowance is made for loss of weight in baking. Thus, how much bread (approximately) is obtainable in baking a sack of flour having a "strength" of 50? 200 lb. flour absorb 50 quarts, or 125 lb. of water. The dough will therefore weigh 325 lb. On baking we may assume a loss of about one-ninth of the dough, that is 325 lb. divided by 9 gives 36 lb.; the total weight of bread will therefore be 325 minus 36 equals 289 lb. Strong flours consequently produce a greater weight of bread from a given weight of flour than do weak ones. It is true that this extra weight is due to water; but fortunately for the consumer the loaf produced is a better one, the process of fermentation is more uniform, and a better-risen and better-ærated loaf is the result, yielding consequently a more digestible and wholesome bread. At the same time strong flours require somewhat different manipulation, they require a vigorous ferment, they will not work properly if the yeast is poor, and the time of fermentation in the sponge should be longer than in the case of weaker flours.

Peculiarities of Strong and Weak Doughs.

If we make a dough with a strong flour and with a weak flour, using the same amount of water in each case, we find on allowing these doughs to stand for a few minutes that the dough made from the weak-flour very soon begins to "run." It is exceedingly soft, and watery in appearance, and spreads out in a flattened cake. If touched with the finger it sticks, and a long tenacious thread can be drawn out. The strong flour dough on the other hand remains hard and firm, and hardly loses its shape at all.

Similarly, if the gluten be washed out of strong and weak flours respectively, the same striking peculiarity is noticeable. The gluten from the weak flour is exceedingly sticky and tenacious. If superficially dried it adheres with great tenacity to everything with which it comes in contact. It is almost without elasticity, it can be drawn out readily into a long thread, and if one end be released there is no tendency to fly back. It is in short soft, sticky, and without elasticity. The gluten from the strong flour on the other hand has just opposite characteristics; it is hard, non-adhesive, and very elastic. It has no tendency to adhere to other surfaces even when superficially dried. You cannot pull it out into a long thread; you can elongate it slightly, and on releasing one end it flies back like a piece of india-rubber.

Strength of Flour Depends upon the Nature of the Gluten and not upon its Quantity.

The following table shows that the amount of gluten has no connection with the strength of the flour, some of the strongest having only a moderate proportion of gluten, and some of the weakest being particularly rich in this ingredient:—

	Gluten.	Strength.	Bread in lbs. per sack.
Purple Straw	9	48	(284½)
Steinwedel	11	46	(280)
White Essex	10	58	(307)
Medeah	16	46	(280)
Australian Poulard... ...	13	45	(278)
Imported Duluth	12	61	(313)
Improved Fife	11	63	(317½)

Strength clearly does not depend upon the amount of gluten. To what, then, is the strength or water-absorbing capacity of a flour due? It is due to a difference in the constitution of the gluten. Gluten consists of two distinct proteid substances according to the American chemists Osboine and Voorhees, one substance soluble in alcohol, which they have called gliadin, and an insoluble proteid, glutenin. These occur in different proportions in the gluten from different flours, and according as one or the other preponderates the flour is strong or weak. Strong flours yield glutens rich in glutenin, and as the proportion of gliadin increases the strength diminishes. This is shown in the following table where a typical strong and a typical weak flour are compared with a flour of average strength:—

	Strength.	Gluten.	In 100 parts gluten.	
			Glutenin	Gliadin.
Improved Fife	73	11	78	22
Toby (allied to Purple Straw)	50	12	74·3	25·7
Austral Poulard	45	13	64	36

From this it is quite clear that although in the particular instances chosen, the weak flours are richer in gluten than the strong ones, the gluten is of different constitution, the weak-flour glutens being richer in gliadin than the strong ones.

These considerations will, I hope, have impressed you with a sense of the important part played by gluten in determining the value of a flour. On the quantity of gluten in the flour depends the nutritiousness of the bread, and upon its quality depends the strength of the flour and its value for baking purposes.

Colour.

The colour of flour is determined by Pekar's method, which is well known to all millers and bakers. About 20 grammes of flour is placed on a piece of board carrying a raised rim along the back. The flour is pressed by means of a spatula into a wedge, and the board plunged under water, removed, and the flour allowed to dry in the air. The colour and surface of the flour are noted both when wet and dry. There is, unfortunately, no means of stating the results of the observations so as to convey to others even an approximate idea of the colours obtained. The instrument known as the tintometer and its modifications are unsatisfactory—that, at least, is my experience of them. There is a considerable difficulty in obtaining the same colour in the tintometer as appears on the surface of the flour—a difficulty due to the fact that in the one case the light is transmitted through glass, and in the other reflected from an opaque surface.

A scale in permanent colours is being prepared in the laboratory of the Department which will enable anybody to reproduce exactly any given tint prescribed.

There is a very great variety in the colours of flours, and since considerable importance is attached by millers and bakers to a good colour, the determination of this characteristic cannot be dispensed with, as it affects the commercial value of the flour. At the same time, the colour of the flour affords no indication of its baking value, and is a very unsafe guide, even as to the colour of the baked loaf. It is true that dirty flours, and flours with a grey tint, usually produce dirty-coloured bread on baking. Yellow flours, however, do not necessarily produce yellow bread. A yellow colour in the flour indicates a high gluten content, and that is the only reliable information as to composition and baking value which is afforded by the colour of the flour.

The colour, undoubtedly, affects the commercial value of a flour, but the valuation appears to be to a large extent a sentimental one.

In my opinion there is a tendency, in New South Wales at least, to lay too much stress upon the importance of a high colour in flour. It is possible to sacrifice too much in order to attain excellence in this respect, and a high colour is nearly always associated with low gluten, and very commonly with low strength.

Which are the best Flours?

The following table, which I have compiled from Jago's book on Bread-baking, shows the strength and gluten content of some of the best-known flours on the English market. The figures for strength have been re-calculated so as to represent the amount in quarts of water per 200 lb. sack (the English sack being 280 lb.)

TABLE showing nature of a few of the best-known flours.

	Gluten.	Strength.
Spring American Patent	13·4	50·7
Spring American Baker's	14·5	52·1
Winter American Patent	8·3	46·4
Winter American Baker's	10-1	49·4
Pillsbury's Crown	16·4	52·1
Pillsbury's Straight	13·0	55·7
Patent from Manitoba Hard Fife	10·8	58·6
Hungarian, Best	10·5	54·3
Azima (Russian)	12·7	51·1
No. 2 Calcutta (Indian)	9·7	51·1
Australian	14·2	48·6
Californian, Straight	7·11	45·7
English White Wheat	9·8	45·5
French Wheat...	10·3	43·6

A glance at this list will emphasize the point I have been endeavouring to make, namely, the importance of strength in the valuation of a flour. The most highly prized flours in the list and those which command the highest price in the market are those with a strength of about 52 and over. We have, of course, a striking instance of this in the high price paid locally for Manitoba flour, as compared with flour from local wheats. This increased value is due entirely to the greater strength of the flour in question, since its colour is very low compared with that of local flours, and its gluten-content very little, if at all, higher.

This class of flour is represented in the list by Pillsbury's "Crown" and "Straight," and by the "Patent from Manitoba Hard Fife." The imported Manitoba flour is, probably, this latter flour, which it will be seen is the strongest flour on the list.

The superiority of the flour made from wheat of the Fife family is apparent. The question then arises,—Can these wheats be satisfactorily grown in New South Wales,; and do they, when grown locally, produce as good a flour as the imported? This matter has been dealt with more fully in the May, 1900, number of the *Agricultural Gazette*.

It will be sufficient to state here that, from the examination of samples of Manitoba grain grown locally in different parts of the Colony —in some parts for the fourth season in succession—I feel justified in concluding that, in the more elevated and the moister districts of New South Wales, this grain gives satisfactory results, both in regard to yield per acre and to milling qualities. Even after the fourth consecutive season it retains all the characteristics associated with this class of grain—the production of a strong flour, clean bran, reddish colour of bran and offal, yellowish and gritty semolinas.

In addition, the colour of the flour has improved in the samples I have examined, and in some cases the flour produced in our small mill from locally-grown Manitoba grain has been quite equal to the colour of the best Sydney flour in the market. It is not impossible that this improvement in colour may be the commencement of a deterioration in the grain when grown continuously under local conditions, and would indicate the desirability of importing fresh seed from time to time. This is, however, merely a theory. Of practical interest is the proof that it is possible to produce a strong-flour wheat of a good colour. As a rule, the wheats producing the best colours are comparatively weak.

Mr. Farrer's Work.

This has been one of the principal difficulties which have been encountered in the attempts to improve the locally-grown wheats. As many of you may be aware, Mr. Farrer has been engaged for many years past in this self-imposed task, and by means of cross-breeding and selection hopes to be able to produce a number of strains, suitable to the different districts of the Colony, which shall be an improvement on the soft weak grain at present grown.

Whether it will ever be possible to provide a variety of wheat which shall combine all the good qualities and possess no bad ones is not easy to predict; but, at least, it appears not too much to expect that we shall soon be in the possession of a grain that is at the same time prolific and a good milling wheat, yielding readily a good quantity of flour of high strength and colour and gluten-content.

Local Wheats.

The following tables will serve to give some idea of the characteristics of the typical grain grown locally and in the other Australian States. In the case of the New South Wales wheat, averages have been struck from a considerable number of samples of the different varieties. In the case of the other colonies the results have been taken from typical samples, specially selected by competent judges, as representing the different types. I regret that Queensland is not represented on this list; but I hope to rectify this omission next harvest:—

Flours from Australian Wheats.

	Name of Variety.	Colour.	Gluten.	Strength.
New South Wales	Purple Straw	Excellent	9·0	48·0
	Steinwedel	Variable (good to grey)	11·0	46·0
	Australian Talavera	Excellent (to yellow)	12·0	50·0
	White Lammas	,, ,,	12·0	50·0
	Allora Spring	Variable (yellow to chalky)	9·0	49·0
South Australia	Velvet Pearl	Excellent	11·0	50·0
	Brodie's Prolific	,,	13·0	48·0
	Steinwedel	,,	11·0	46·0
	Carmichael's Eclipse	,,	11·5	47·5
	Dart's Imperial	,,	11·5	48·0
	Ward's Prolific	,,	13·0	48·0
Victoria	Mallee	Very good	13·0	49·0
	Northern Districts	,,	12·0	47·0
	Goulburn Valley	Excellent	11·0	49·0
	Western Districts	Very good	10·5	50·0
	F.A.Q. 98	,, (yellowish)	13·75	47·0
	F.A Q. 99	,, (yellowish)	12·2	48·5
New Zealand	Velvet (1)	Rather dark	12·5	48·0
	Velvet (2)	,, ,,	12·0	48·6
	Velvet Ear	Excellent	8·0	50·0
	Red Tuscan	Very good	8·5	46·5
	White Tuscan	,, (whitish)	8·5	47·0
	Red Straw	,,	8·0	47·0
	Hunter's White	,, (yellowish)	12·5	45·0
Tasmania—Sample from Department Agriculture, Hobart		,, (whitish)	6·7	46·4

Pigs at the Hawkesbury Agricultural College.

(Continued from p. 303, Vol. X.)

By GEORGE VALDER.

FINDING that the importation of pigs made at the end of 1898 was successful in every way, and that the demand for young stud pigs of the improved breeds was rapidly increasing, the Department decided to obtain additional animals from England, America, and from some of the well known herds in the colonies, for the College piggery. The following is a list of the animals lately received, others are shortly expected to arrive:—

Berkshires.

From R. Swannick, Esq., Royal Agricultural College, Cirencester, England.—1 boar, "Earl Russell." Sire, "Loyal Berks" (6,391); dam, "Sallie" (6,485).

From E. M. Betts, Esq., Gladesville.—2 young sows from a trio which won 1st Prize at the Sydney Show of 1900, for Berkshire sows under three months. Sire, "Master Trafford;" dam, "Sally."

From the trustees of the late Thomas Walker, Tenterfield Station, Tenterfield.—3 young sows, winners of 2nd Prize, Sydney Show, 1900, for trio of sows under three months. Sire, "Tenterfield Augustus" (imp.); dam, "Rebecca 5th," by "Sir Humphrey" (imp.)

Tamworths.

From John Norman, Esq., Tamworth, England.—1 boar, "Norman Clinker." Sire, "Cliff Clinker" (4,547); dam, "Cliff Chine" (7,720).

From Egbert de Hamel, Esq., Tamworth, England.—1 boar, "Middleton Egbert." Sire, "Middleton Molesworth" (5,395); dam, "Middleton Mucilage" (9,290).

Presented by G. T. Chirnside, Esq., Werribee Park, Werribee, Victoria.—2 sows by "Middleton Melton" (imp.), out of "Werribee Lady" (imp.) 1 sow by "Middleton Melton" (imp.), out of "Knowle Duchess III." 1 sow by "Middleton Melton" (imp.), out of "Confidence."

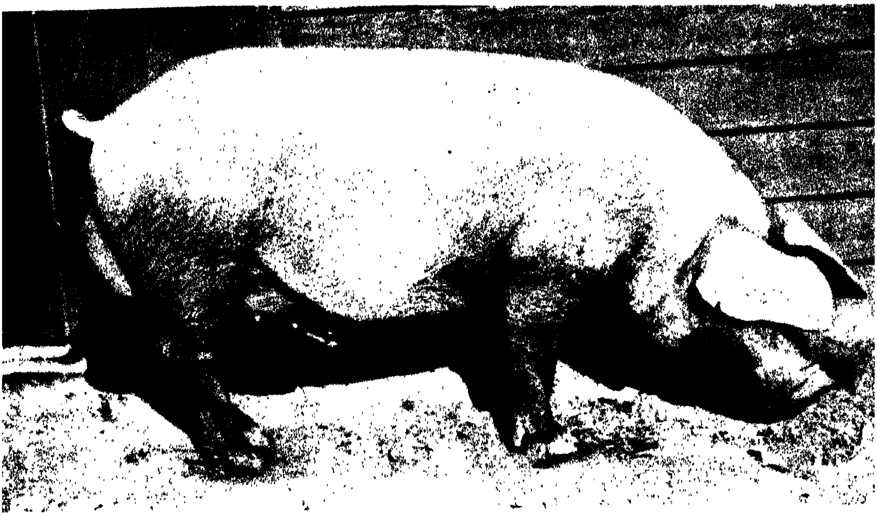
Large Blacks.

From T. P. Brand, Esq., Foxearth, Essex, England.—1 boar, "Black Prince." Sire, "Orchard's Jumbo" (109); dam, "Shimpling Lass" (442).

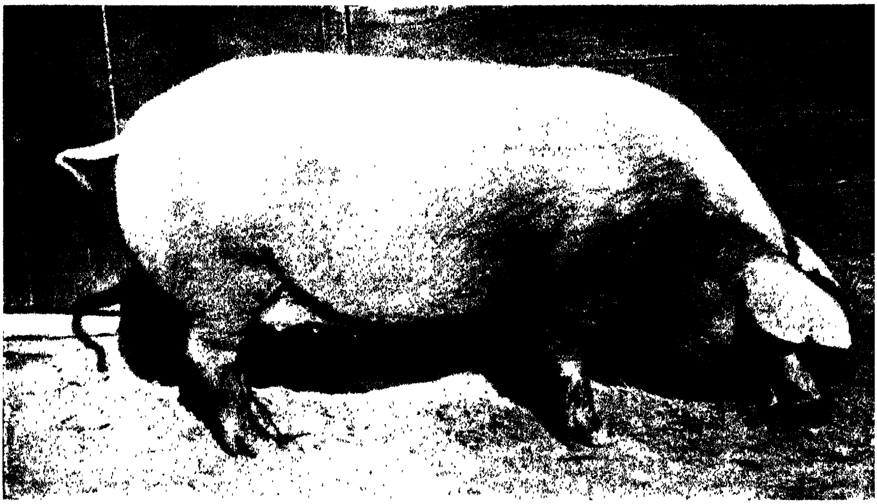
From A. H. Cobbald, Esq., Bury St. Edmonds, Suffolk, England.—1 boar, "Akenham Emperor." Sire, "Black Jim" (37); dam, "Akenham Cornish Lass" (14).

Also, from A. H. Cobbald, Esq.—3 sows by "Eldo Devon" (71), out of "Eldo Beauty" (222), "Eldo Ada" (204), and "Eldo Cornwall" (224).

Besides the pigs mentioned above, we have by careful selection, breeding and feeding, obtained a number of boars and sows from the



Large Black Boar, "Akenham Emperor."



Large Black Sow, "Eldo Princess."

IMPORTED PIGS AT HAWKESBURY AGRICULTURAL COLLEGE.

first lot of imported pigs, which in most instances are superior to their parents, and these have been added to the stud.

Young boars and sows bred from the pigs of both importations will be sold as soon as available, and, already, orders are being booked.

The Large Black Pig.

The boars and sows lately imported by the Department are, I believe, the first specimens of this breed brought to New South Wales, and the only other representatives in the colonies are the property of J. W. Porter, Esq., Adelaide, South Australia.

Although generally regarded as a new breed, it is really an old one which has lately again come to the front, being considered a suitable breed for producing the modern type of baconer. For many years it has been bred in the southern counties of England in large numbers, and has been kept quite pure. Although it has not yet been properly tried here, I feel sure that there is every chance of its success. It is a splendid grazier, very hardy, a rapid grower, of a quiet disposition, and a "good doer." It has great length of body, deep sides, long broad loin, and nicely shaped hams. The lean and fat are well intermixed, and the flesh is comparatively fine in texture for so large a pig. The large lopped ears fringed with hairs, and the rather long nose somewhat detract from its appearance, but the head is comparatively small, and from the above description it is easily seen that it is of a remarkably good shape for producing baconers. In colour it is like the Essex, quite black, and, in fact, it much resembles that breed, only that it is a longer pig.

The Large Black Pig Society, formed in 1898, has done much to popularise this breed, and it is now rapidly coming to the front at all the large agricultural shows in England.

The following is an interesting cutting from the *Cable* :—"There is money in the old black pig, particularly in his improved form, and those who wish to establish a reputation in the showyard will find it one of the best breeds to take up. As a show animal its honours are all in front of it, and the breeders with greatest skill at the present time are those who will reap the honours and profit. However, there are already many good and shrewd breeders engaged in perfecting it, and that there is keenness to acquire the best specimens is shown by the fact that at a recent sale 15 and 16½ guineas were paid for two sows from one herd, and in two or three instances batches of sows from various breeders averaged between £9 and £10. Altogether the prospects of the breed are very cheering."

Bacon Pigs.

At one time the demand was for fat bacon, and store pigs were kept in lean condition until they were ten, twelve, or even fifteen months old, then fed heavily with fattening foods until they reached a weight of 200 lb. to 300 lb., and then were killed for bacon. The sides of bacon made from pigs fed in this manner generally showed a layer of fat of 6 inches to 7 inches in thickness.

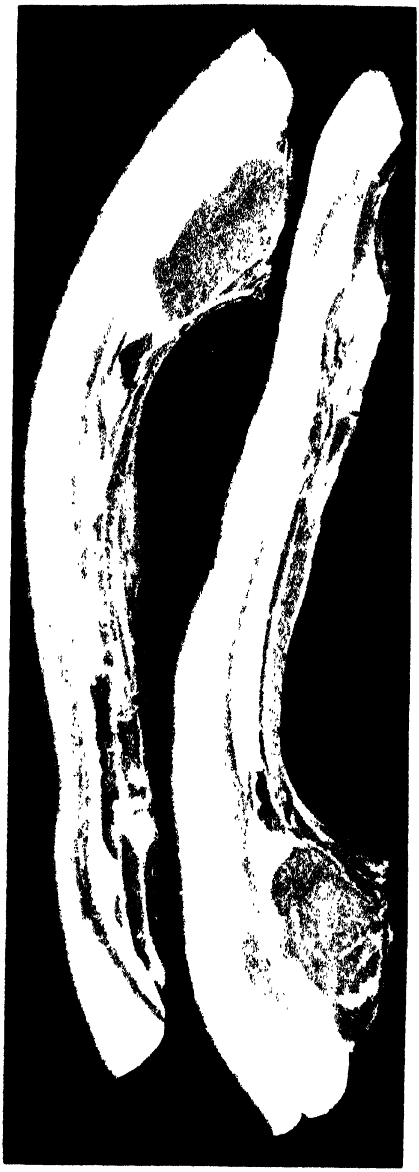
But now the taste has quite changed, and in breeding and feeding baconers we must aim at producing flesh rather than fat. The pig required by the bacon-curers must have great length between the hams and shoulders, the ribs should be long and deep, flank of good thickness, small in the head, light in the shoulders, hams square, deep, and well covered down to the hocks; and, when dressed, the sides should show an even width of fat along the back of from 1 inch to 1½ inch. The meat must be streaky, not thin and poor, but firm, lean, fine in texture, and well flavoured. Instead of pigs of the old small breeds of twelve to fifteen months old, the breeder now finds that the seven to eight months' pig of the large modern breeds pays best for market purposes.

For the English market preference is given to the large Yorkshire, the Tamworth, and the Large Black, or crosses of the Tamworth with the Berkshire and Yorkshire. In this Colony either the pure Berkshire or the Berkshire-Yorkshire seem to be the favourites with the curers. The pure Tamworth is not much liked, but the cross of this breed with either the Berkshire or Yorkshire is rapidly coming to the front, and at the present time Tamworth boars for crossing are greatly in demand. Some curers favour the Poland-China, but most of the pigs of this breed that I have seen show too large a proportion of fat for our requirements. Of the Yorkshires, the middle breed is most in demand here; but in England and Canada the large breed is considered to be by far the best baconer.

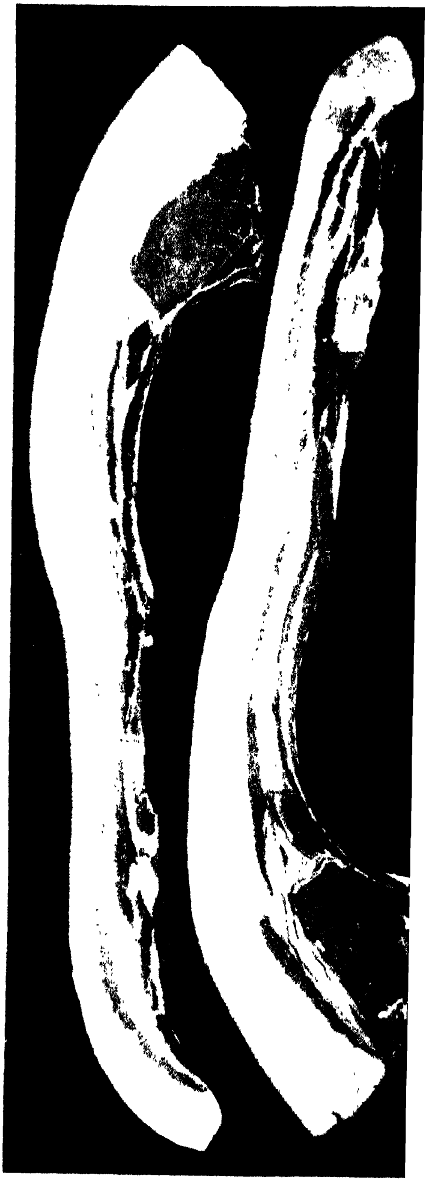
The reason why the long sides are so much in request is that the "middles" always bring a much higher price than either the "ham end" or "fore end," and, of course, the longer the side the greater the proportion of middle.

Bacon Test.

With the view of obtaining more definite information with regard to the most suitable breed or cross to keep for raising baconers for the local market, I decided to commence a series of comparative tests. The first of these has just been completed, and, although it is hardly right to draw any conclusions from a single test, the result is very interesting. At the College piggeries we have pure-bred boar and sows, many of which are imported animals, of the large, middle, and small Yorkshires, Berkshires, Tamworths, and Poland-Chinas; and shortly the Large Blacks will be added. The progeny are sold for breeding purposes to farmers in all parts of the colonies. Every care is taken in sending out nothing but first-class animals; and, as in nearly every litter there are one or two pigs which are unsuitable for breeding purposes, these are culled out, and turned into porkers and baconers. Therefore, every year we get a large number of culls, from which we can in many cases select suitable animals for bacon tests. Later on I expect to breed enough to be able to use some of the best animals for this purpose. This year there were representatives of four breeds and the crossbred available. A number of average pigs of these was selected and forwarded to the well-known bacon-curer, Mr. C. Barnes, of Liverpool-street, Sydney, and consisted of the

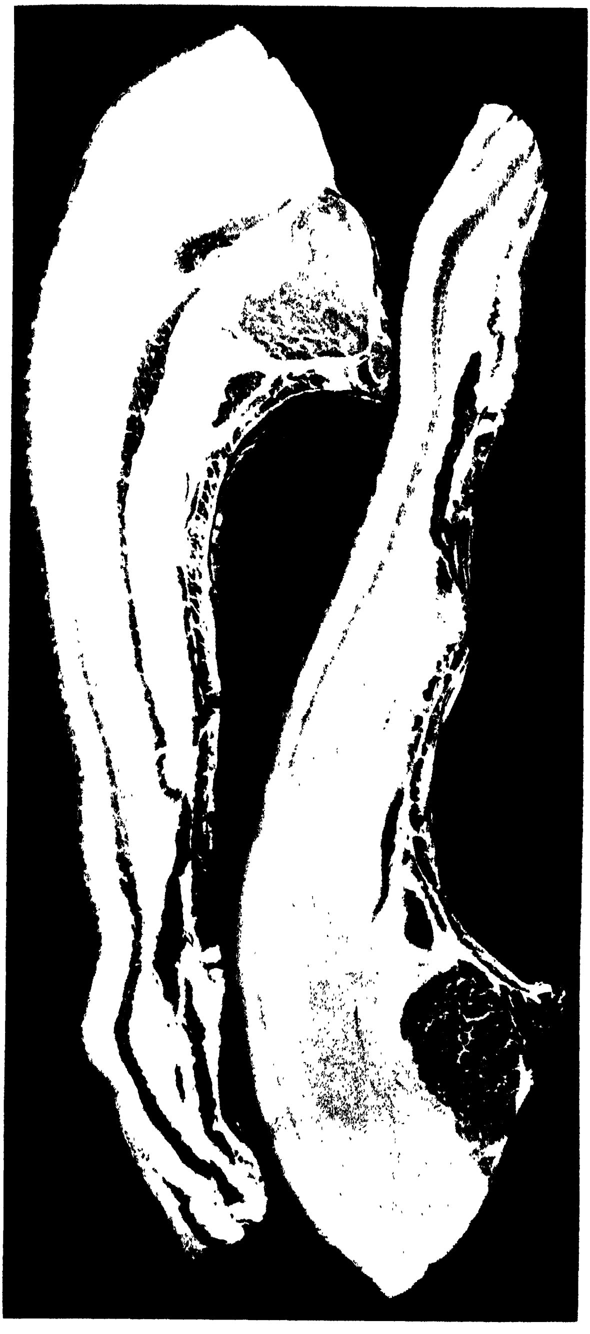


No. 1 ; Berkshire.



No. 2 ; Yorkshire—Berkshire

COMPARATIVE TEST OF BACON, NO. 1, HAWKESBURY AGRICULTURAL COLLEGE.



No. 3; Tamworth.

COMPARATIVE TEST OF BACON, No. 1, HAWKESBURY AGRICULTURAL COLLEGE.

following:—2 Berkshires, 2 Large Yorkshires, 2 Tamworths, 1 Middle Yorkshire, and 1 Yorkshire-Berkshire. These were weighed before leaving the College, again weighed by Mr. Barnes as soon as they were killed and dressed, and finally the sides were weighed as soon as properly cured, with the following result:—

No. of Pigs.	Breed.	Age.	Average Live Weight.	Average Dead Weight.	Average Yield of Bacon.
		Months.	lbs.	lbs.	lbs.
2	Berkshires	7	166	112	72½
2	Tamworth	8	226	145	106½
2	Large Yorkshire	7	172	122	89
1	Middle Yorkshire	7	165	104	89
1	Yorkshire-Berkshire ...	7	169	112	92

From these results it appears that well-bred pigs of all these breeds are sufficiently heavy at seven months for market purposes. No seven months Tamworths were available, and therefore pigs a month older had to be used. When brought in from the paddock for "topping up" they appeared to be "long and lean," but they fattened up and laid on weight faster than any of the pigs of the other breeds, and were, when killed, too heavy for market. From the weights given above it would appear that the Yorkshire-Berkshire gave by far the heaviest percentage of bacon, and the Berkshire the lowest. But it is hardly fair to judge by a single test, especially when so few animals were used, as so much depends upon the individuality of the animal. The weights will, however, be valuable in combination with future tests.

At the invitation of Mr. Barnes, representatives of the leading wholesale and retail bacon-dealers of Sydney assembled at his establishment in order to inspect the bacon and give their opinion as to which was the best quality for market purposes. After careful consideration they placed them as follows:—

1. Berkshire.
2. Yorkshire-Berkshire.
3. Tamworth.
4. Large Yorkshire.
5. Middle Yorkshire.

In the illustrations the comparative size of each bacon is shown. The reproduction of natural size.

The judges were of opinion that had the Tamworths been killed a month earlier they would have taken a higher place. The Berkshires and the Yorkshire-Berkshires were pronounced to be of splendid quality, and very suitable for the Sydney market. The Yorkshires, although showing meat of excellent quality, had too large a percentage of fat.

Mr. Barnes, in his report, says:—"I quite agree with the judges that for quality the Berkshires had the advantage, as when cut the meat showed a proper streakiness, besides being fine in texture. But I consider that had the Tamworths been killed at the same weights as the Berkshires, they would in all probability have given quite as much satisfaction in this respect. Generally speaking, I consider that the Berkshires are the best pigs from a bacon-curer's point of view, as the ham is more plump and saleable than that of the Tamworth. I also believe that a cross between these two breeds will produce one of the most useful types of bacon-pig. The Yorkshire-Berkshire sent produced a good saleable bacon, but the pure-bred Yorkshires were much too fat for the local market. It seems to me that from a breeder's point of view the Tamworths were a long way in front of the others, but, of course, it would hardly be fair to come to any decision on this point until some of the other tests are completed."

In the next tests I hope to include some few cross-breds, such as the Tamworth-Berkshire, Tamworth-Yorkshire, &c., besides another lot of pure-breds.

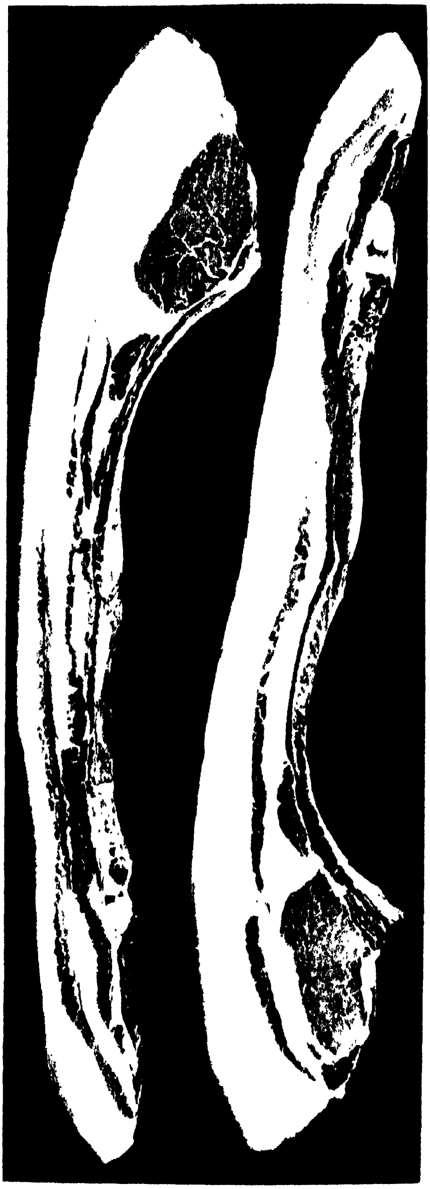
The pigs used in the above test were all fed as follows :—Soon after weaning they were turned out in a grass paddock, where plenty of warm shelter was obtainable, and where a constant supply of fresh water could be given. As soon as the grass began to get scarce small supplies of green fodder, including barley and tares, sorghum, maize, lucerne, &c., were fed daily, and later on pumpkins, squashes, melons, and vegetable marrows were given. On this food they grew rapidly, and were quite ready for "topping up" when six months old. They were then brought in and placed in the fattening pens. Here they were fed on maize and peas, and at the end of the month were ready for the curer.

Bacon-curing.

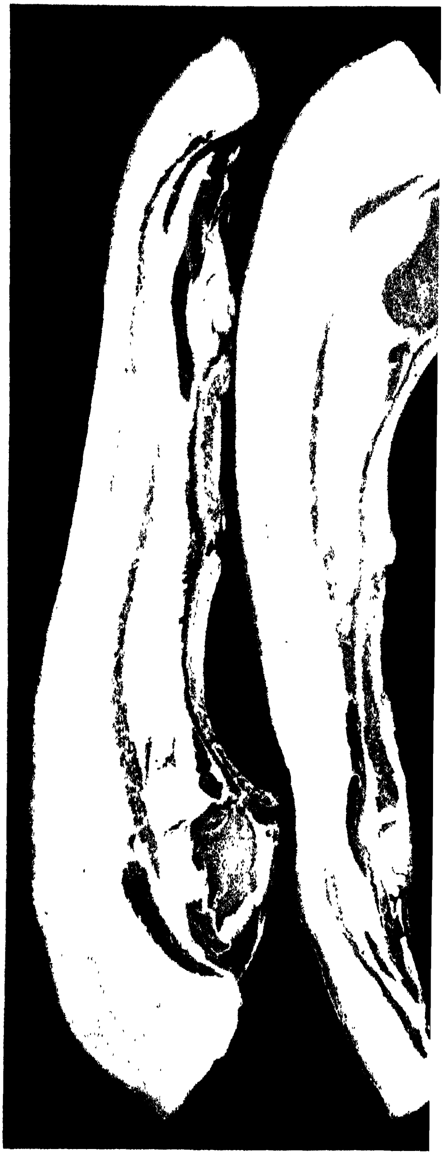
The following is a description of the system of killing and curing, so successfully carried out by Mr. George Daley, who has charge of the College Piggeries :—

Killing.—The slaughterman turns the pig on to its back, taking care not to bruise it in any way; he then stands over it with one foot on each side of its shoulder. His assistant pulls back the fore-feet; the slaughterman then places one hand on the bottom of the pig's jaw, and, with the other hand, he takes his knife and quickly makes an incision in the pig's throat from the brisket downwards; then thrusts the knife in again at the end of the cut nearest the jaw, with the edge turned slightly upwards, and runs it back to the brisket, giving the blade a sharp twist in order to cut through the jugular vein, taking care not to cut into the heart, as pigs generally bleed better if this is left untouched. Provided the sticking is properly done the pig will bleed rapidly and suffers little pain. This is a very important point, as, unless the pig bleeds freely the meat will not cure well.

Scalding—Where pigs are killed on a large scale, such as at bacon factories, the water for scalding is kept at a temperature of from 165° to 180° Fahr., but where only a few pigs are being treated a safe scald is three buckets of boiling water to one of cold. The pig is plunged into the scalding water and left there for about a minute, when the hair will readily leave the skin; the pig is taken out and the hair rapidly scraped off. Should any hairs remain after scraping, they are then shaved off with a sharp knife. The carcase is then scrubbed with a scud, using plenty of clean cold water. After it has been thoroughly cleaned the hind legs are cut below the gambrel joint, so that both main cords may be reached, under which the gambrel should be



No. 4 ; Large Yorkshire.



No. 5 ; Middle Yorkshire.

COMPARATIVE TEST OF BACON, NO. 1, HAWKESBURY AGRICULTURAL COLLEGE

inserted. The pig is then hung up and the intestines removed, placing a piece of wood in the mouth to keep the jaws open and allow the blood to run out. After this the inside of the carcase is thoroughly cleansed, and it is then hung in a cool place until the meat is firm enough for cutting up.

Cutting up.—The trotters from the forelegs are first removed, and the head is then cut off with a knife, starting from where the pig was stuck and continuing round the small part of the neck, and aiming at leaving as much meat on the sides as possible. After the neck is cut round the head and the body are turned round in opposite directions, and the head then comes off quite readily. The knife is then run down each side of the backbone on the inside of the pig, and the fat removed, so that it will be out of the way of the saw when cutting out the backbone. Next the knife is drawn down the back on each side of the backbone, starting from each side of the tail and finishing at the neck. The coupling-bone is then sawn through on the inside of the pig between the two hams. Then the backone is cut out by sawing down through the ribs on each side as closely as possible to the backbone, taking care to turn the blade of the saw slightly below the last rib, so as to cut the neck-bone clean out. The two sides are then placed on a table, and the kidney fat is removed by first running the point of the knife round between the fat and where the diaphragm had been cut out, and then the fingers are inserted between the fat and the meat, and the whole piece is pulled out towards the ham. This fat supplies the best quality lard. The meat which lies on the inside of the backbone, from the loins back to the knuckle-bone of the ham, is then cut out. This piece of meat is of no value for salting, and is coarse and stringy, but when fresh, if baked or fried, it makes an excellent dish. In curing the oil in the knuckle-bone of the ham often causes trouble, and some curers take the bone out. This, however, spoils the ham for market purposes, and a better plan is to make a cut into the bone with the point of the knife, and allow the joint oil to run out; this generally prevents any trouble. The trotters are then cut off the hams, and the sides stacked on either a brick or cement floor. When stacking the fleshy portions are peppered all over with saltpetre; this removes any blood that may have been left on the meat, and gives the flesh a nice pinky appearance.

Dry-curing.—In dry-curing the bacon is rubbed daily for nine days. For the first day's rubbing coarse salt, with a small quantity of saltpetre, is used. For five pigs weighing from 130 to 140 lb., it takes about 50 lb. of "Black Horse" brand Liverpool salt and 10 grains of saltpetre. For the other eight days a mixture of equal parts of brown sugar and salt is used. On the first day the sides are rubbed until the salt commences to stick well, which is generally in about seven minutes. The first two days' rubbing are the most important, and, unless the meat cures then, it may be considered that it is in an unsuitable condition for curing. The salt and sugar mixture is used for imparting flavour as well as for curing. After the rubbing is finished the meat is stacked in a tank or vat, first putting a thin layer of salt on the bottom; a layer of sides is put on this with the rind downwards, then another layer is crossed on this, and so on until all the bacon has been put in the tank. It is then turned every day for a week, the sides which are at the top to-day being at the bottom to-morrow, and so on. This allows the pickle which is made during the curing to be well distributed over all the sides. After the first week it is turned every other day for from two to three weeks, varying it according to the size of the pigs. It is then ready for washing, drying, trimming, and smoking.

Brine-curing.—Two pounds of "Black Horse" brand Liverpool salt is dissolved in every gallon of water. This liquid is then strong enough to float an egg or a potato. To every gallon of the liquid the following is added:—

4 lb. brown sugar,
2 oz. saltpetre,
2 oz. sal-prunella,
½ lb. allspice,

and to every 50 gallons added 1 lb. of ground pepper corns. The allspice is sown in a cotton bag to prevent it from mixing with the pickle. The pickle is boiled for an hour, and is ready for use as soon as it is cold.

This pickle can be kept in constant use if it is boiled every two months, and replenished with spice, sugar, &c. Boiling causes all blood, fat, &c., to rise to the surface, when such matters can be easily skimmed off.

Pickle, properly looked after, becomes stronger and more valuable with age, and will last a long time.

The pork must be cold, or it will not take the salt properly. The colder the flesh the easier it is to cure, proving the advantages of a refrigerator.

Pump pickle into the shoulders and hams—from two to four injections in the shoulder, and two to three in the hams, according to their size.

Three tanks or tubs are necessary. Those at the College are built of brick and cemented.

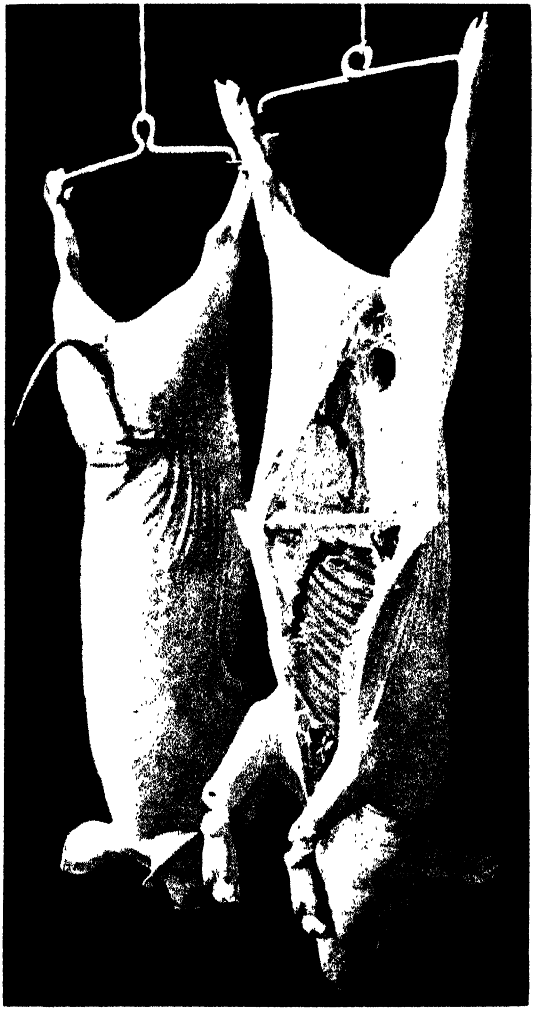
Have bacon tank No. 1 empty. Cover bottom of tank with a thin layer of salt, then place a layer of bacon, taking care, should any of the sides overlie each other, to put a sprinkling of salt between. Sprinkle salt all over the pork and also sprinkle very lightly with saltpetre; then pack another layer of bacon crossways upon the first, and so on until all the bacon is in tank. When packing the tank, keep every layer as nearly level as possible. Batten the meat firmly down, and cover the whole with pickle. If using new pickle, add one pound of brown sugar to every ten sides, dissolving it in pickle before use.

Miss one whole day before turning the bacon into No. 2 tank, viz:—Bacon put into No. 1 tank on Monday should be turned into No. 2 tank on Wednesday, and into No. 3 on Friday. The bacon will then be ready to take out of pickle on Monday, giving it seven days in tanks.

Use saltpetre in No. 1 tank only.

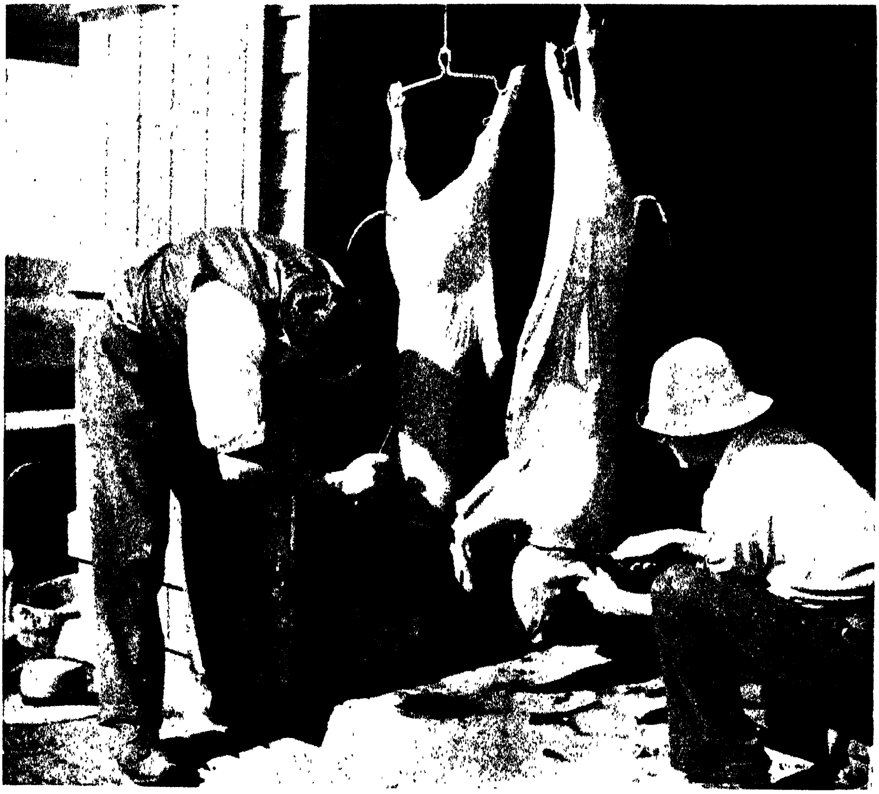
Stacking.—Mark off part of the floor for stacking the bacon upon as it comes from tanks. Cover the space with salt; then put a layer of bacon, covering it with a light coat of salt; then another layer

Some of the Pigs used for Bacon.



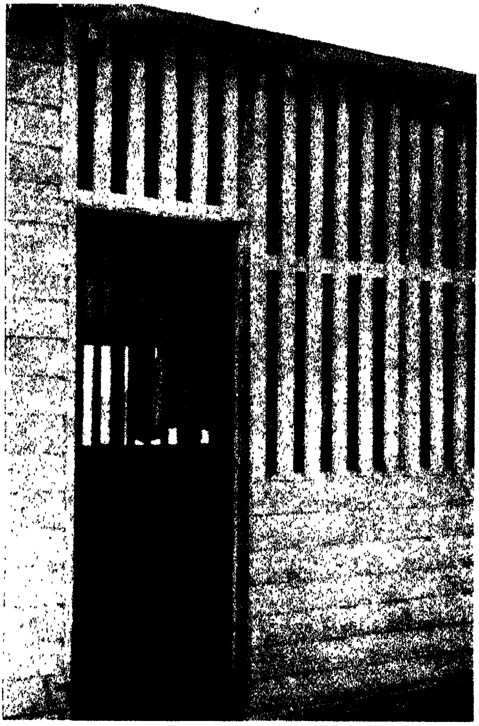
Ready for Cutting up.

BACON-CURING AT HAWKESBURY AGRICULTURAL COLLEGE.

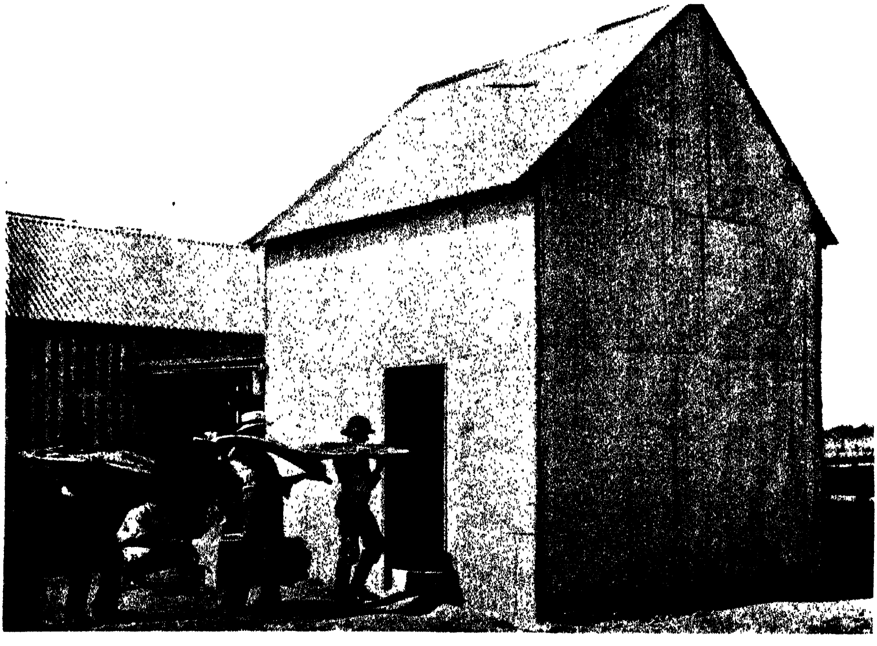


Cutting off the head and removing the backbone.

BACON-CURING AT HAWKESBURY AGRICULTURAL COLLEGE



The Drying Room



The Smoke House.

BACON-CURING AT HAWKESBURY AGRICULTURAL COLLEGE.

of bacon, crosswise to the first, and so on, taking care to have layers level, and as much pressure on the pumped parts as possible. For the first fortnight turn the stacks twice a week, and once a week for the other two or three weeks. The bacon can then be washed and smoked, or hung up in the green state (unwashed) until required.

Hams when cut from the side.—Keep tanks and pickle for hams only. Follow instructions as given for bacon, with the addition of rubbing the face of every ham with brown sugar before covering with salt and saltpetre. After seven days take hams out of tanks and rub brown sugar over their faces; place them singly in rows, resting on a support to keep them level; then salt. For this purpose a room should be set apart, and drained into a small well in the floor, as the pickle that comes from the ham is worth keeping.

Leave the hams in the sugar-room one week. Go round them every morning and cover any bare patches with salt and sugar.

Take the hams from the sugar-room, brush them with a dandy brush to remove any slime that may have appeared on them, and stack them two deep in salt. The third week stack them three deep, and the fourth week four deep. After the fourth week, build them into a square stack and turn it every week for four weeks, giving the hams a good pressing.

When washed and soft, they can easily be batted into shape.

The hams are now ready for washing and smoking. Use ham pickle for pumping.

Washing.—After the bacon is cured it is placed in water, just warm enough to bear one's hands in, and is then brushed over with a dandy brush, which removes all fat, sugar, slime, &c., from the surface. It is then placed in a tank or vat, and covered with clean cold water, in which it is allowed to remain for from eighteen to twenty-four hours. This takes a lot of the salt out, and renders it a mild-cured bacon.

Drying.—The bacon is next hung up in a well-ventilated room to dry. If the weather is favourable, *i.e.*, if the days are fine and dry, with a slight breeze of wind during the greater part of the time, the bacon is generally sufficiently dry in from six to seven days.

Trimming and Polishing.—In trimming the bacon the sharp points of the rib bones are sawn off, and the remaining part of the fore leg also sawn off level with the shoulder. The knife is then run over the belly-part of the rib bones, and any loose pieces removed. The sweat skin is scraped off with a sharp knife, and the side is then rubbed over with a little olive oil, which gives it a nice glossy appearance.

Smoking.—The bacon is then placed in the smoke-house. As will be seen by the illustration, the fire-place is outside the smoke-house, and the smoke is conveyed through a flue to the interior. This allows of the bacon being smoked in a cool state, which is, of course, a great advantage. Native apple-tree (*Angophora*) and hardwood sawdust, also damp corn-cobs, are used, and they are generally considered to somewhat improve the flavour of the bacon. From four to five days' smoking is given, care being taken not to smoke too much, as this greatly affects the flavour.

Swarm Catching and Hiving.

ALBERT GALE.

I HAVE said before that swarming is nature's way of "replenishing the earth" with bees; and that this is brought about by favourable seasons or climatic conditions. We know when these are favourable to swarming by the blooming of honey-bearing plants and genial spring weather.

Swarming conditions within the hive are the construction of queen cells and drone comb more or less filled with brood. These conditions—that is, early queens and drones—to a certain extent are in the hands of the beekeeper. He has a mechanical power to advance or retard the production of queens or drones. One thing worth noting is that drones are not produced in a well-conditioned colony, unless the season is favourable to queen production. The reason is obvious; drones are unnecessary where there are no queens, and queens cannot reproduce without drones. Nature balances these things. The power we have in the matter is this: keeping our bees in ill-constructed hives—hives that are cold and damp, and the bees themselves wintered on a too limited supply of stores, that have come through winter on the verge of starvation, and so dwindled in numbers that there is not strength enough to hatch out a large number of eggs, will not swarm early, no matter how favourable the season may be. Conditions the reverse of the above are the ones that will aid the beekeeper with early swarms, providing the seasonable conditions are favourable. In the west of England they have this proverb: "A swarm of bees in May is worth a load of hay; a swarm of bees in June is not much out of tune; but a swarm of bees in July is not worth a single fly." There is a deal of truth in it.

Be prepared. Have all the required adjuncts at hand and in their place for catching your swarms and hiving them. Choose the site on the grounds where you intend to keep them. If it be under natural shade, trim off over-hanging twigs, so as to have head-room. You will find the advantage of this, especially if you are in the habit of wearing a bee-veil. Nothing is more annoying, when you are handling bees, than to find a sudden pull at your head-gear, and you stand bare-headed with a frame of irritable bees in your hand. Under such circumstances an apprentice at the work would find it hard to follow out the advice I so often give—be gentle and kind in handling your bees. Level the spot where each hive is to stand. Place four pieces of brick in the ground, so that they may stand about 2 inches high. The surfaces of these must be even, try them each way with a spirit-level. On these place your hives. Before placing the frames in the hives see that the starters (artificial foundation comb, from 1 to 2

CATCHING A SWARM.

inches deep, attached to the top bar of the frame) are securely fastened to the top bar. For hiving purposes I prefer these starters to full sheets. In placing the frames in the hives see that they hang plumb and equidistant from each other. Put a quilt over the frames and put the lid in position. In fact, treat each empty hive intended for the reception of bees as if the colony were in it. You will find an advantage in this when your new swarms issue forth. A swarm-catcher of some description, a bee-veil (if you are timid when among bees), and a queen-cage should be near by, so that you may be able to place your hand on them at a moment's notice. A queen-cage is necessary if you keep your queens with clipped wings. If bees are kept in a town it is an advantage to clip the queen's wings, and also, if your occupation keeps you around about your bees during swarming season, otherwise there is no advantage in it, especially with first swarms. There are a number of other swarming devices, all more or less useful, for which see supply dealers' catalogues.

In the article on Symptoms of Swarming I have mentioned the piping of the queen. By placing the ear to the hive this cry may be heard on the eve prior to swarming. But the absence of the cry is no proof the bees will not swarm on the morrow. On the morning of the day the bees intend to swarm, the inmates of neighbouring hives will be seen issuing forth and returning with all the energy they are capable of, whilst the hive the swarm is expected from will be quiet and labour will appear to be almost suspended, only a few bees passing in and out. Yet this is not an infallible sign. I have frequently seen a swarm of bees on the wing, and mixed up with them numbers of bees with their pollen-baskets well packed with pollen; evidently they had not received word that swarming was to take place that day.

The time of day for bees to swarm is not well defined. It is some time between sunrise and sunset. I have known them to swarm as early as before 7 a.m., and as late as 6 p.m., but as a rule, it is during the hottest part of the day. It is a pretty and interesting sight to see the bees issuing forth from the hive for the purpose of swarming. They all appear eager to see which will be out first, pushing and tumbling one over the other. Bees with their wings fringed with hard work and old age; middle-aged and baby bees; young, downy fellows, even too young to take part in the general exodus. You will find many of the latter running about outside the hive. If the hive is close to the ground, and of easy access, they are soon inside again; if not, it is as well to pick them up and put them on the alighting board. A young bee is worth more than an old one.

To any beekeeper it is pleasant to watch the bees manœuvring in the air; advancing, receding, rising, falling and circling; not looking about for the queen. She is mixed up with them, but she has no allotted place in that busy crowd. Whilst on the wing the hum they emit is a pleasant one, and to them one of joy. No one has yet discovered how the order to march is given within the hive, or how the intelligence is communicated from one to the other. Nor do we know how the information is telephoned from one to the other, when they are on the wing, that a chosen spot has been selected, and it is time to settle. A practised ear can detect a change in the hum. At once, when the sound of the bees change, you will see those bees that have been scattered far around heading for the spot selected. Indeed, there appear to be many spots chosen, for you will see the bees forming little clusters here and there. These are all ultimately abandoned for the central one. Watch the central one. You may see the queen, if she be unclipped, alighting with the rest. Pick her gently up by the wing and cage her for a few minutes. (If the queen is clipped, stand by the hive as the bees issue forth and cage her there.) When a fairly good number of the bees have settled, shake them into a receiving-box, and at once, if you have caged the queen, place her amongst them. If you have not secured the queen, watch the box into which you have shook the bees. If they persist in returning to the place whence you shook them you must shake again, and repeat the process as often as they return thither. One way of ascertaining if the queen is in the receiving-box is to move it a few yards from the spot in which you first placed it. If the bees follow, you may be sure the queen is there. Nevertheless, a large number of bees will continue to hang about the place where they first clustered. If you have secured the queen, these will soon begin to dwindle away. If you have little or no experience in swarm catching and hiving, do not get excited or hurried over the job. It is the quiet easy movements that will bring success. You have no occasion to be afraid of the bees. When they have the swarming impulse on they are most docile, and put on their best behaviour. You may do almost anything with them if you move and handle them gently. I have seen the most timid ladies, when given to understand this and shown how to do it, pick bees up by the handful without being stung, and you may do the same. In doing so, put no pressure whatever on the bees.

If the bees settle some distance from the apiary, as soon as about two-thirds of them are in the receiving-box begin to remove them homewards by easy stages—at first say 5 or 6 yards, and increase the distance each removal. As soon as you see that the bees have found the box, give the move-on order, and shift the box nearer home. Do not wait till sundown to take your bees home. The stragglers will follow the box. There will be some few that may not do so; these will return to the hive from whence they came.

Presuming that you have been following all the advice I here tender, and the permanent home for your bees has been "swept and garnished" and in every way ready to receive its inhabitants, the last stage in the removal of the receiving-box containing the bees should be close to their permanent home. Remove the lid of the hive and its quilt, exposing all the frames to full view. Take your box of bees, and with one jerk tumble the bees in amongst the frames. In a very few minutes they will have descended into the hive, and cluster to the frames. Put the quilt over them, placing a stone on either corner to prevent the wind lifting it. Shortly afterwards remove the stones and put the lid of the hive in its place. The bees will soon find the entrance, and your trouble is over.

Probably next morning you will find them very quiet. They are secreting wax and comb-building. Remove the lid and quilt, and see if all the frames are correctly spaced; if they are not, you know what to do without my telling you. Some on the following day will be seen examining the hive, flying a little way off, and returning. They are learning the geography of the neighbourhood. Within a few days you will see them carrying in pollen. All the danger of their leaving the hive is, perhaps, now over. I say "perhaps," because bees are such erratic things. I have known bees, after they have been hived and built combs as large as your hand, take a fad into their heads and clear out. Why, I cannot tell, and I do not think any one else can. Should they do so, there is nothing for it but to go through the whole work again, with this addition: Place in the hive they have vacated a frame of comb from another hive containing eggs and developing brood. If every other effort to make them take to their new home should prove a failure, that will almost invariably succeed.

Now, if you have been anything like in luck's way, the whole process from the time the bees made their exit from the parent hive to that when you hive your new swarm will not occupy more than an hour. But to this statement I must make certain reservations. Did the bees settle in an easy accessible place? Did they settle near the apiary?

All here stated has reference to first or early swarms, which are led by a pregnant queen, when there is a certain amount of assurance that they will not abscond. Casts or after swarms—those that come out with virgin queens—may give a little more trouble than here detailed.

LIQUID MANURE FOR TOMATOES.

THE following method of preparing liquid manure for tomatoes is recommended by a correspondent:—

> One peck of horse-droppings and half-peck of soot should be placed together in a bag, which should be sunk in any ordinary barrel with the head out. The barrel is then to be filled up with clean water, and the mixture may be used in the proportion of one to four of clear water until the soil about the plants is moist. This manure is suitable, not only for tomatoes, but for most other plants. In the case of tomatoes it would be an advantage to sprinkle a little of one of the cheaper forms of potash about the roots previously. Tomatoes do not require feeding with liquid or any other manure until the fruit is set and swelling freely. As the liquid is used, the barrel may be filled up with clear water, and after this has been done once or twice the bag may be stirred round with a stick or spade. In a small garden the manure will last for three or four months, but when it is evident that the liquid is getting weaker, the manure and soot must be renewed.

Dairy Stud Farm, Berry.

PROSPECTUS, RULES, AND SYLLABUS OF INSTRUCTION FOR STUDENTS.

1. In view of the growing importance of the dairy industry, the Minister for Agriculture has decided to afford students an opportunity of perfecting themselves in the various branches thereof; and, with this object in view, has made arrangements whereby entering students may obtain instruction in dairy-farming, cattle-breeding, rearing and management, and butter-making in all its branches.

2. The primary object of the Dairy Stud Farm is to depasture the recently-imported stock, and raise therefrom a number of young animals, which will in due course be offered for sale to the dairy-farmers of the Colony, thereby introducing new blood into our dairy herds.

3. The Farm can also be utilised for the purpose of affording information as to the merits, demerits, and characteristics of the various breeds of dairy cattle, the treatment of milk and cream, and the manufacture of butter, as well as the cultivation of the various crops utilised for feeding dairy cattle. Arrangements have been made with the proprietor of the Berry Central Butter Factory (one of the most completely-equipped factories in Australia), whereby students at the Farm may obtain a full and complete knowledge of butter-making on a large scale, and the management of creameries and dairy machinery in all its details. By this means it is expected that capable factory managers will be turned out, who will not alone be able to efficiently manage dairy factories, but will be able to afford information to the surrounding community on the merits of the various breeds of cattle, and their suitability or non-suitability to different localities and conditions.

Conditions of Admission.

4. *Age.*—Each candidate for admission must be over the age of 16.

5. Parents and guardians of students under 21 years of age will be required to give an undertaking that they will at all times conform to the Regulations for the management of the Farm; and students over the age of 21 years shall give a similar undertaking.

6. Applications for admission of students will be received by the Under Secretary for Agriculture, Sydney, at any time; but students will be selected for appointment to vacancies according to qualifications.

7. Physique and general aptitude for farm work will be considered in conjunction with the candidate's educational and other attainments.

8. Each applicant must produce a satisfactory testimonial from his last teacher or employer, a medical certificate from a duly qualified and registered medical man as to his state of health, and such other evidence as to character, fitness, and qualifications, as the Minister may direct.

THE BERRY STUD FARM.

Accommodation.

9. Students must make their own arrangements for board and lodging, as no accommodation is provided at the Farm.

Outfit.

10. Students employed on the Farm may wear the ordinary clothing suitable for such avocations; but those working in the Central Factory, and in the farm dairy, will be expected to wear something clean and white—white trousers and white coats or aprons being most suitable.

Notice of Leaving Farm.

11. In the event of any student desiring to leave the Farm before the expiration of the complete course, one month's notice in writing must be given to the Manager.

Course of Study and Examination.

12. The course of study shall extend over one year, or two sessions. The first session commences 23rd January and ends 22nd June. The second session commences 23rd July and ends 22nd December.

13. Students may present themselves for examination in butter-making and creamery management at the end of the first session; but they will not be eligible for certificate in dairy-farming until they have spent at least one year on the Farm.

14. By the special permission of the Minister a student may be allowed to remain on the Farm for a second year's course of instruction.

Fees.

15. The fee for the course shall be £2 2s.

Special Sessions.

16. For the convenience of students who have previously put in a term at one or other of the Government Farms, and for Creamery Managers, the Minister hopes to be able to arrange special sessions wherein most of the time shall be devoted to dairying work in the Berry Central Factory. For these special courses a fee of £2 2s. shall be charged.

Live Stock.

17. Students will be instructed in the breeding, rearing, feeding, and improvement of cattle, the characteristics of the various breeds of dairy stock, and their suitability to various conditions and climates; and also in the rearing of calves, and the feeding of calves and pigs.

18. The following breeds of cattle are kept on the Farm:—Shorthorns, Holstein-Fresians, Guernseys, Jerseys, Red Polls, Ayrshires, Kerries, and Dexter Kerries, and practical instruction on each breed can be afforded.

Internal Dairy Work.

19. The testing of milk and cream, the separating of milk, the management of dairy machinery, and the principles of butter and cheese-making, will be taught; and further instruction in the manufacture of butter on a commercial scale, as well as the general management of a central butter factory, can be had at the Berry Central Factory.

Examinations for Certificates.

20. Students entering for examination in Dairy Farming will be examined practically, in all that pertains to the milking of cattle, the separating of milk, the rearing of calves and pigs, and the general treatment, feeding, breeding, and management of dairy stock. Papers will also be set embracing these subjects.

21. To obtain a Certificate for Dairy Work, Butter-Making and Factory Management, Students will be put through a practical examination in the testing and separating of milk, the pasteurising of milk and cream, the ripening of cream, both naturally and artificially, and the manufacture of butter; as well as in the working of dairy machinery, including refrigerators. Papers will also be set embracing these subjects.

22. *Books Recommended for Study by Students.*

The Agricultural Gazette of N.S.W., especially that of 1898, 1899 and 1900.

"British Dairy Farming," by Professor Long.

"Cattle: Breeds and Management," by William Housman.

"The Story of Germ Life," by H. W. Conn.

"Dairy Bacteriology," by Frendenreich.

"Milk and its Products," by Wing.

"Cheesemaking," by Prof. Long and J. Benson.

Lectures.

23. Lectures will be delivered during the session by Mr. M. A. O'Callaghan, embracing the entire course of Dairy Instruction and with special reference to the influence of bacterial life on dairy products. Lectures and practical instruction will be given by the Manager on the crops of the Farm.

24. In the Central Factory, instruction will be given to students by the Manager, and also by an officer of the Dairy Branch of the Department of Agriculture.

Discipline.

25. Each student shall conform to the Regulations for the time being in force for the government and management of the Farm, under penalty of expulsion, by order of the Minister, or such lesser punishment as the Manager may impose.

Working Hours.

The working hours shall be as such as the Manager shall direct.

When working at the Central Butter Factory, students shall obey the Rules, and observe the hours arranged by the Manager of the Factory.

Farm Regulations.

1. Farm students are to attend all lectures and examinations, unless specially exempted.

2. In the event of a lecturer being unable to deliver his lecture or carry on a class, the students concerned are to devote their time to Practical Dairying, unless any other special study is assigned to them.

3. All games are expressly forbidden during the hours specified for lectures or classes. During lectures, classes, or working hours, careful attention to the subject in hand is demanded.

4. When leave is needed, special written permission must be obtained from the Manager, who alone can grant such leave. All such permits must be returned to the Manager, endorsed by the Officer-in-charge, and showing the exact time of return from leave.

5. Students are not to be absent from the Farm without leave from the Manager or Officer-in-charge. A book to be kept for the purpose of recording all such leave given.

6. Each student is required to keep a Farm Journal from his personal practical observation.

7. Punctuality, order, and quietness are to be observed on the Farm at all times. Unpunctuality, disorder, and noise will render students liable to lose good-conduct marks, or to be dealt with in such other way as the Manager may determine.

8. Any student, who, without the sanction of the Manager, brings or causes to be brought into the Farm buildings, or on to the Farm, any fermented or spirituous liquors, or uses or has in his possession therein or thereon, without the permission of the Manager, firearms of any description, is liable to instant expulsion.

9. The habit of smoking is expressly discountenanced, and is prohibited at all times, except in places set apart for the purpose.

10. All damages to the farm property caused by the students, jointly or individually, through neglect or carelessness, will be charged to their respective accounts. The decision of the Manager as regards the amount to be paid shall be final.

11. All cases of injury to animals and implements are to be reported without delay to the Manager.

12. Visitors are not allowed, without permission from the Manager, to inspect the farm, stock, or buildings.

13. Students are required to obey the orders of the Manager, Teaching Staff, and those put in charge of them for the day.

14. Students are invited to question the workmen on the Farm on matters pertaining to the work, implements, &c.; and any workman refusing to give the information sought, or answering in an uncivil manner, may be dismissed by the Manager.

15. Students will require to keep their work well in hand, that as the examinations approach they can regulate their studies so as to make the time at their disposal sufficient for due and complete preparation; as, owing to the work of the Farm having to be carried on with systematic regularity, under no circumstances can it be interfered with by the granting of extra time to students for private study at the cost of their practical duties, which are as important to them as their other studies and work.

16. Students using tools and failing to return them to their proper places will be held responsible; and any student damaging implements, harness, gates, or other property on the Farm through carelessness or neglect will have to make the same good at his own expense. All such losses and breakages must be at once reported to the Manager.

17. All officers and men connected with the College and Farm are expected to be punctual themselves, and to see that strict punctuality is observed by the students in all departments in which they are concerned.

18. At end of the full course an examination will be held, and to get a General Certificate the student must obtain at least 50 per cent. of marks in each subject of the syllabus. In practical work 75 per cent. must be obtained.

19. Any student who is guilty, either within or without the Farm, of profane, immoral, or insubordinate conduct, or who after admonition wilfully breaks any of the Regulations, or persistently neglects his studies, is liable to dismissal.

20. The Minister may at the close of any session direct that any student whose retention is likely to be unprofitable to the student himself, or injurious to other students, or prejudicial to the discipline or the reputation of the Institution, be not permitted to return, and therefore such student's name shall be removed from the Roll.

21. Examinations in all the subjects of the Farm course will be held at such times as may be deemed necessary by the Manager.

22. The Manager shall report to the Minister any student who shall have failed to pass in a Sessional Examination.

23. No punishments except such as the Manager approves shall be inflicted.

24. The Manager will allot to officers their respective duties on the Farm, and will have power to frame Regulations for the guidance of the students and all engaged on the Farm. Such Regulations to be subject to the approval of the Minister.

25. Any neglect of the above Regulations will be punished as the Manager may direct.

Reception of Students.

The Farm will be ready for the reception of students on the first of September, 1900.

The City Agriculturist.

W. H. CLARKE.

Treatment of a Yearling Orchard.

During his first season, the beginner in orchard work is likely to be confronted with a lot of minor difficulties that are not explained in the textbook. This is so simply because it is exceedingly hard for a novice in this kind of work to resist the desire to try "little plans of his own"; and it is not until the spring advances and the trees begin to make growth, that the consequences of departure from what long experience has proved to be the right methods begin to crop up.

The principal thing to remember when transplanting a fruit-tree is that the less the soil immediately about the roots is disturbed during the first year the better. By keeping the surface for two or three inches thoroughly stirred, great good can be accomplished in the conservation of moisture for the use of the young tree; but every time we attempt to deeply fork or break the ground during the first six or eight months from planting out, the roots that are endeavouring to get a good grip of the earth are bruised or broken, with serious results to the vigour of the tree. We will take for example an orange tree, planted out this season in ground that has been properly broken up and mellowed. Under the proper system of planting the roots would be placed in a steep-sided, rough-bottomed hole, about 4 feet across. The excavated soil, before being refilled, would be bashed about and turned a couple of times, so that it could be poured over the roots and lie as closely as water. The steep sides would be broken down with a fork, so that no root, in the effort to spread, might encounter a solid wall, such as a spade-cut in a stiff soil will sometimes make. Such a space, 5 or 6 feet in diameter, so treated would provide ample foraging ground for the roots of a tree during its first season. In the following autumn, the soil for about 2 feet from the trunk can be spaded over to a depth of 4 or 5 inches, and beyond that circle, the cultivation could be deepened gradually to a depth of at least 9 inches. At the end of the first year, any roots inclined to run too near the surface or to become like rats' tails can be severed with a sharp spade, which will induce a more spreading and downward growth.

If at the time of planting the weather is particularly dry, a couple of buckets of water are a great help to the tree. The best way to apply it is to fill the hole about three-parts in with soil, and carefully sprinkle the water over the area through which the roots extend. Then, when the rest of the soil—made as fine as possible—is spread over, the moisture will be retained for a long time, and the effect will be the nearest possible approach to the much-to-be-desired day's rain after transplanting. During any prolonged dry period in late spring and summer, a few gallons of water, applied in a little trench scooped in a circle about a foot or 18 inches away from the stem, will do a lot of good. But watering trees in this way is laborious, and ought never to be carried out unless the trees by closing their leaves show absolute want of it. Mal di Goma, or collar-rot, of citrus trees is at times attributable to the deep-planting of grafted trees; but this fungus disease, which destroys the bark around the butt of the tree just below the surface, is often to be traced to the indiscriminate use of water in immediate contact with the stem of the tree. Soil in good mechanical condition—which the refilled soil at all events is likely to be in—is just like a piece of sponge, and when water is applied, say a foot away from a tree, the moisture will percolate gradually through the whole mass of soil occupied by its roots.

In an ordinary season, however, and even in a fairly dry one, where the soil has been deeply and thoroughly tilled beforehand, watering is usually unnecessary. Moreover, in the majority of districts most suitable for fruit, the settler during the first few years is hard-pushed to obtain sufficient water for domestic use.

The work that has been carried out during the past decade or so at the experimental orchards of this Colony and in other countries where droughts have to be contended against, has proved conclusively that by frequent use of hand or horse-hoes that stir the surface soil, the same, if not better, results can be secured at considerably less cost than is possible under any ordinary system of watering. During the early part of this spring we had just enough light rain to render roughly ploughed land friable. Then was the opportunity to get over it with harrow, roller, and horse-hoe, until the soil, right up to the trees and all between, was as fine as ashes. When the soil about the trees is in that condition, it will hold moisture well, but it will hold it better still if a mulch of at least 6 inches thickness of leaves, straw, or rough stable manure, sufficiently rotted to mat, is spread about the tree in a circular mass of, say, 4 feet diameter. In mulching the trees, particular care must be taken not to pack the straw, or whatever is used, tightly about the stem, which would provide a harbour for crickets and other insects that might gnaw the bark. It is not a bad plan, if time can be spared for the work, to remove the mulch a couple of times during the summer. The time for doing this is when the soil has been well soaked by a few days' rain and is just becoming dry enough to break up readily. With a digging fork or hand wheel-hoe the soil can be thoroughly stirred to a depth of a couple of inches and left for a day or two to sweeten. Then the mulch can be replaced for another month or two. This plan also affords an opportunity of destroying any weeds that may be coming up through the mulch.

An infallible sign that the bare soil needs stirring is the formation of a crust. If the operation is neglected when that appears the surface will begin to crack, and of course the soil will soon become parched to a considerable depth. In using the horse-hoe, or whatever implement is available for the work, care must be taken not to ridge up the soil. The idea is to leave as small a surface exposed as possible, and it can easily be understood that the smoother the ground is left the better. If the right time—immediately after a light rain—has been chosen for the spring cultivation, there should not be many clods; if there are, it is worth while having a go at them, when just damp, with the scraper described in August *Gazette*. Once they are pulverised they will give no more trouble for the season, and if, when the hoe is set to stir deeply, the shoulders of the tines throw up a bit of a ridge, it can be flattened down by using the weed rake, or tying a piece of trace chain across the back of the machine, so that the loop trailing the full width of the cut, levels off the soft soil, and leaves the surface as flat as a billiard table.

On steep hillsides, finely cultivated soil is liable to washaway unless particular care be taken in the matter of surface and underground drains. But unless the surface soil is extremely shallow and the subsoil very stiff, it takes a tremendous downpour to wash soil on which nothing but the rain itself falls. The trouble is mostly due to the sudden rush of water from higher, hard ground, and this should be guarded against by excavating capacious drains so as to effectively prevent a drop of floodwater finding its way on to the cultivated area. When that is done, and the orchard is sufficiently well drained, naturally or artificially, there will not be much risk of washaway, however finely the soil may be kept divided. If it is thought desirable to make rough channels, they should always be run diagonally and midway between a row of trees. Where other crops are not grown in the orchard, it is not a bad idea to put in between, say, every second row of trees, across the slope, a narrow strip of thickly-sown oats. This would not interfere with cultivation, would protect the soil from serious washaway, and provide a bit of greenfeed for the livestock. Of course, where vegetables, &c., are grown, the drills would be across the slope, and serve the same purpose.

Protecting the trunks from sunburn.

It is very curious to note the difference of opinion on a point like this. Some orchardists will assure you that not only is it unnecessary to bandage or otherwise cover up the trunks of young trees during the summer, but that such a practice is detrimental to their growth. No doubt if the young tree—citrus trees are especially referred to now—has an umbrageous head, and is well clothed all the way down the stem with leaves, no further protection is necessary; but in the effort to get a good foundation for a shapely and well-balanced head, it is often necessary to cut away a great deal of the nursery top, and for some reason or other the stem leaves may fall off before their time, so that the trunk becomes exposed to the full blaze of the sun during the greater part of the day. It will be generally noticed that sparsely foliaged trees thus exposed do not make satisfactory headway, and keep throwing out an abnormal growth of water-shoots in the effort to protect their trunk. To test the effects of bandaging and sheltering the trunks, as compared with leaving them exposed and allowing the water-shoots to grow unrestrained for a season, the writer last year selected a number of young orange trees of the Australian

Navel and St. Michael varieties—a couple of each—which had all been headed back pretty severely at the time of planting out, and were at the time all about the same size, and getting exactly similar cultural treatment.

(*a*) Two were left quite unprotected, and the suckers were rubbed off every time any showed out.

(*b*) Two were left unprotected, and the suckers were allowed to grow unrestrained.

(*c*) The trunks of two more were densely, but loosely, wrapped with strips of stringybark, from the fork of the branches to the ground.

(*d*) Two were protected by pieces of bark placed upright in the ground, on the north-western side.

By autumn the first pair of trees had made very little growth, and the stem had a dull, hard appearance, as if the tree were bark-bound.

In the second lot water-shoots had grown amazingly, and from the two trees a big armful of useless stuff had to be cut. The real head of the tree had not put forth more than a dozen leaves, and, worst of all, the stem itself had to be almost ringbarked in removing these suckers.

The bark-bandaged lot threw out a few suckers, but they did not attain any size. The head growth was most satisfactory, and the trees with a little nipping back this spring will be models. Upon removal of the bandages the stems were found to be beautifully clean and streaky, and were certainly as thick again as the sunburnt ones.

The pieces of bark used for the fourth lot afforded a certain amount of shelter, but not sufficient, and the condition of the trees was not very much better than that of the unprotected ones.

Last season was a good one for a test of the kind and the results seem to point so plainly to the advantages of bandaging that a couple of hundred young citrus trees in the same orchard will be treated in this way in the coming summer. The operation is not a difficult or expensive one. If stringybark is not available, straw, or strips of old bagging or hessian would do. The main thing is to fix the bandage in such a way as not to press tightly anywhere against the trunk. Care should be taken not to allow any of the material used to rest right down in the fork of the branches, as during the season the increased growth of the wood may bury it in the bark; besides, spiders and other insects harbour there.

In the case of deciduous trees the writer has had no experience of bandages except with cherry-trees. Unless a good many tufts of leaves can be induced to grow on the sunny side, the bark blisters terribly, and it is necessary to wrap the trunk to keep the tree in good condition.

Apples, apricots, and peaches, as a rule head so vigorously in their first year, especially if cut back to a whip-stick at planting out, that artificial shelter is not needed at all.

Plums that are inclined to grow rather straggly would certainly be benefited by protection from the direct rays of the sun during their first summer.

Stakes.

There is an old maxim that a young fruit-tree is sometimes all the better for an occasional shaking up—it stimulates root growth. No doubt such is the case, but in many newly planted orchards the trees are prevented from making satisfactory progress from lack of proper attention to staking. Any little stick seems stout enough to secure a yearling tree, and when the tree has, by imperceptible degrees, outgrown its stake, other matters may engage our attention, and we suddenly find that for weeks the tree has been wobbling about with every breeze until it has worn a big hole in the ground, and perhaps scraped the wood bare at the collar.

There is no economy in makeshift stakes, and it is a mistake to use round saplings or any wood like packing-case pine that quickly rots in the ground. The most satisfactory and durable stakes are those split out of a good big log—blackbutt for preference—and which can be driven at the time of planting-out into the ground from 2 to 3 feet without splintering to pieces. Unless the shelter is very dense, or is provided naturally by the lay of the ground, it is difficult to decide how a vigorous young tree should be tied to keep it perfectly, or at least sufficiently rigid. Some orchardists stake before planting, putting the stake upright on the southern side about 6 inches from where the stem of the tree will come. This plan saves a great deal of bother at planting time, and avoids the risk there exists, when the stakes are put in after planting, of injuring a main root on the side where it is most needed.

The upright stakes can be sawn off so as not to interfere with the spread of the tree, and if care is taken in tying to put a loop around the trunk, knot it, and then twist the material until it forms a firm sort of spring, there will not be much danger of the tree driving against the stake and injuring itself during heavy northerly winds.

Another plan that is often adopted is to place the stake on the most exposed side of the tree, on the slope, binding the trunk as securely as possible (without being tight enough to interfere with the sap-flow) to it.

Whatever method of staking is adopted, the ties should be constantly watched and slackened off or tightened as the growth of the tree or shrinkage of the binding material demand. It is a bad plan to use wet bark or fibre for ties. Stringybark, in a fresh, sappy condition, is certainly the best to make a neat job with, but after a few days' dry weather a tie that seemed perfectly taut will stretch until the tree can flop about in all directions. The same thing will happen with bagging or rags used wet.

When young citrus trees are found to have been rocking badly, it is advisable to carefully open out the soil all around the collar and examine the bark. If it is bruised or chafed, the wound should be trimmed with a very sharp knife and dressed with Stockholm tar or grafting wax. Injuries of this kind often lead to collar-rot, and if neglected may result in the death of the tree. The hole that is worn should never be filled up by pouring in dirt; the soil for some inches should be loosened and gently tamped back around the butt of the tree.

For varieties of apples on blight-proof stocks, and planted in lower lying and more friable soils usually chosen for these trees, it is sometimes necessary to put in two or three stakes to afford proper support until the roots can control the big head of heavy wood. The enormous advantages of cutting back to a whip-stick at planting time are made more apparent in apples than any other class of fruit-trees. As a rule, the trees as they come from the nursery are quite shapely, and it seems like sacrilege to cut off the nice little head entirely; so it is left on, with perhaps the tips snipped off for luck. In a fair season there is about a quarter of a hundred weight of heavy whips, 6 or 8 feet long, swaying and twirling until pruning time. Then the tree cannot stand without supports, and to balance it you have to cut away just the very branches that seemed so full of promise at planting-out time.

Insect and Fungus Troubles.—Where the trees are limited in number, it is not worth while during the first year going to the expense of a spraying or fumigating outfit. In matters of this kind it is always cheaper in the long run to get the best appliances, and until the trees begin to bear there is not much satisfaction in expending a considerable sum for a machine or outfit that is too big for the work to be done.

In the case of scales like the brown olive that almost invariably makes its appearance on young citrus trees, a spare hour occasionally can be spent in destroying them with a strong kerosene emulsion—2 gallons kerosene, ½ lb. softsoap, 5 gallons water (1 gallon boiling, 4 fairly warm)—smeared on the scales with a little paint brush.

Red scale can be treated in the same way. If it should increase rapidly—and it may do so if summer grass is allowed to run to seed and attract red-heads and other birds that apparently carry the scale larvæ from infested to clean orchards—it may be necessary to get a spray pump, or make a little tent for fumigating with If an ordinary garden syringe, with a fine rose, is available, the trees could be sprayed with it; but it must be remembered that the quantity of material thrown on to a tree by such means is much greater than would be thrown by a spray pump, and there will accordingly be danger of the surplus running down the stem to the roots. To prevent this, an old piece of woollen stuff might be tied around the stem to absorb the liquid, and thus prevent it doing any harm.

Scale, like San Jose, on young deciduous trees, can best be treated with pure kerosene, applied with a paint brush. The use of a brush may appear terribly finnicking to anyone whose ideas of orchard work run on more exalted lines; but the main thing is to nip pests in the bud, and it is really astonishing how many trees you can get over in an hour or two with a brush. In using pure kerosene, particular care should be observed not to splatter it or to let it run; just wet the bark and no more.

The black peach aphis is striving very hard for the distinction of being classed as the most ubiquitous and troublesome orchard pest. At one time it confined its attention solely to the peach family. Every spring, during the last few years, this aphis is found in countless hordes on every green shoot in the orchard. It is such a beastly little underground engineer that to combat it successfully is no easy matter.

A decoction of a plug of the vilest procurable tobacco, stewed all day in a jam-tin of water, according to most calculations, ought to destroy a hippopotamus. Spread with a feather, and great care, over a colony of aphides settled on an orange twig, such a brew appeared to be received in the way of a stimulant. At any rate, the next day the same twig was just as densely crowded, and it was not until it had been dipped in the jam-tin and held there for at least a couple of minutes, that the twig was cleared of its enemies.

The main difficulty with things like these aphides is that the foliage and wood they select for their prey is so tender that the adoption of very drastic means of destruction is apt to do as much harm to it as to the insects.

According to the Entomologist, they winter at the root of the tree, and the best way to deal with them is to put tobacco dust in a circle at the butt of the tree, so that the rain can wash the juices down into their quarters, and the survivors will have to crawl, at the cost of their lives, into the mass of tobacco dust, in the effort to ascend the trunk in spring.

Hares.

Even in closely settled districts, orchards that are not enclosed with a vermin-proof fence are visited by hares, which do great damage to young trees of all varieties by nipping the bark and shoots. The writer, after trying most of the ordinary specifics, finds the best and certainly the cheapest plan is to smear the trunks of all small trees with a mixture of lime and night-soil. It is not a pleasant mixture to apply, but where hares are bold and mischievous, this treatment keeps them at a distance, and can do absolutely no harm to the tree or buds. You want a fairly long-handled bush to do the smearing with, and it can easily be provided by tying a fourpenny paint-brush to the end of a lath or piece of lattice wood.

Some people protect their young trees from hares by the use of a netting screen. Where several hundred trees are to be done, the plan takes a good deal of wire-netting, which is ruined for any other purpose. There is the disadvantage, too, that it is difficult to get at the weeds that may come up within the screen.

Cropping between the Trees.

The question is often raised as to whether it is wise or not to grow crops of cereals, roots, or ordinary vegetables between the trees in young orchards. The answer is, that unless you can afford to let the land lie idle and are prepared to keep the cultivator going the whole season to prevent baking of the soil and the growth of weeds, grow everything you can; but do not work on the penny wise and pound foolish system of expecting fruit-trees and heavy crops to thrive on a ration that is barely sufficient for either. In spring and summer all crops should be sown in drills with fertilisers well mixed with mould or fine soil. It is just as well to mention here that in the sort of spring and summer seasons that now appear to be chronic, the use of home-made manures, *i.e.*, horse, cow or sheep manure, even if fairly well rotted, is hazardous, and for the production of crops that will give a fair return for the cost of putting them in, readily soluble manures will be necessary. Under such circumstances, drilling is the more economical method, and, moreover, it is possible, among drilled crops, to keep improving the mechanical condition of the soil, and at the same time prevent the growth of weeds and conserve moisture.

In this way it ought to be possible for the young orchardist to raise a good deal of produce during spring and summer in the shape of maize, melons, beans, sweet potatoes, tomatoes, and odds and ends with a very moderate outlay per acre for commercial fertilisers. Towards autumn the land could be dressed right up to the trees, which should receive the lion's share, with whatever stable manure and slowly soluble fertiliser, like bone-dust, is available, and put under a crop like oats to provide green feed and, perhaps, some hay for the horse. The stubble turned under would do the soil good. At all events, the mere growth of a dense crop would be of material benefit to the land. Then in after years, when the trees begin to yield, systematic manuring of them can be commenced, and the crop-growing between the trees can be gradually curtailed until the whole area is free for the trees and an occasional green manure crop.

Diseases that affect Cucumbers, Melons, and Tomatoes.

The losses that are directly incurred from the attacks of disease in cucumber, melon, and tomato crops every spring and summer are simply incalculable. It is no exaggeration to say that the yields are reduced practically from one-third to one-half by such visitations, and the trouble is that in the absence of a rigid preventive system, all that we can do after a fungus disease has made its appearance in the crop will be of small avail to diminish the damage. No one would dream of planting the crops mentioned, or any others for the matter of that, on an unfenced area. Animals would eat and destroy the plants. In the same way, now that the rots and blights have come to stay in our midst, we must put up a barrier against their invasion of our cultivation patches. In making the barrier effective it is necessary to commence with the soil. Fungus diseases, as a rule, find the most congenial home in a soil that is laden with stagnant water, *i.e.*, where the drainage is imperfect. Let us see to that item right away. A simple test is to dig a hole about 18 inches deep in different parts of the cultivation patch, and keep pouring water steadily into it until you get the hole filled to the brim. If at the expiration of twenty-four hours all the water has soaked away, you may take it for granted that that patch of soil is sufficiently well drained. Another good test, and the one that good cultivators often go by, is the ease or difficulty with which a spadeful of soil will brash up a few days after rain. If a single stroke with the flat of the spade will pulverise the soil, bad drainage is not its complaint; but, on the other hand, if the soil clings to the spade (or to the mouldboard of the plough) and can be beaten into a mass, the drainage is imperfect and it must be remedied.

About the most elaborate and comprehensive treatise on drainage that has been written in recent years is that which appeared in successive numbers of the *Agricultural Gazette* two years ago; and any one who desires to become conversant with all the whys and wherefores of the operation would do well to study Dr. Hannemann's paper, as well as Mr. McMinn's article which was published in the *Gazette* and reproduced in the *Farmers' and Fruitgrower's Guide.*

For small areas, however, cultivators may safely work on the very cheap and for their purposes sufficiently effective system of 2 ft. 6 in. drains 20 ft. apart. The main thing is to get the true levels, and in excavating the drains to secure a floor that falls with the contour of the land in an absolutely straight line. No matter whether tile pipes or rubble are used, there must be no irregularities along the bottom of the drain. If there are the water will lodge and give trouble. From a quarter-acre cultivation patch that is properly drained and attended to you will obtain more produce than from an acre carelessly or imperfectly prepared. Moreover, the cutting out of drains and laying pipes or stones and brush is pretty stiff sort of work, and once done it is buried and you cannot see directly whether everything is working satisfactorily or not, so it is well to make sure at first, and if there is not time to do the work thoroughly one season, do part of it and finish when there is no necessity for hurry.

Having attended to the drainage, and having well aerated the soil by a good, deep forking or ploughing in the first instance, and plenty of stirring with a wheel-hoe afterwards, care must be taken not to destroy chances of success by putting seeds in immediate contact with a mass of imperfectly prepared compost or highly nitrogenous artificial fertiliser. If we could rely upon more frequent showers in spring, and not so many withering westerlies, young plants of cucumbers, melons, pumpkins, and tomatoes could manage right enough, and benefit hugely with even the crudest of manure. But the experience of many years past shows that of all seasons the period that embraces the critical stage of the growth of the crops mentioned is most unreliable. The result is often that in the midst of abundance of manure the young plants languish, and never during the term of their life enjoy health sufficiently robust to resist the attacks of their enemies.

But even when everything possible has been done to ensure uninterrupted and vigorous growth, the plants may still fall victims to the attacks of disease, the spores of which are lurking in the soil or neighborhood. That is why experts lay so much stress on the importance of avoiding ground that has carried disease-infested crops, and from which every particle of the plants that might harbour spores or seeds of the fungus has not been removed. That advice is excellent, but on a small area it is not always possible to make changes sufficiently remote to guard against re-infection.

The best thing, and in the long run the most satisfactory, is to be ready to periodically spray the plants with Bordeaux Mixture (Dr. Halsted's formula for these plants—4 lb. bluestone, 4 lb. fresh lime, 50 gallons water—is the one that has been most systematically tested) from the moment they appear above ground until the blossoms appear. Of course, in some situations more or less exposed to sun, dry winds, or other important influences, the quantity of water in the spray may have to be increased; this could always be determined by sowing, *earlier than the others*, a few plants in the rows for trial purposes. The mixture could be applied to them, under what you can estimate as fair conditions, a couple of days in advance. The effect could be noticed and the spray regulated accordingly, without fear of doing harm.

It has been estimated that in seasons favourable for the spread of fungus diseases—muggy weather—half a dozen applications may be necessary, a couple in the first stages of growth and four in the full foliage. In the former work 50 gallons of spray will do for an acre; in the latter 100 gallons may be required. This means that for six sprayings during the season 500 gallons of Bordeaux Mixture. Bluestone (pure) for spraying is quoted at about 4d. per ℔.; unslacked lime of best quality is about 2s. a cwt. The formula, as given by Dr. Halsted, is:—

4 ℔. bluestone,
4 ℔. lime,
50 gallons water.

Therefore, for 500 gallons of spray there will be required—

	s.	d.
40 ℔. bluestone, at 4d. =	13	4
40 ℔. lime, at 2s. per cwt. =	0	10
	14	2

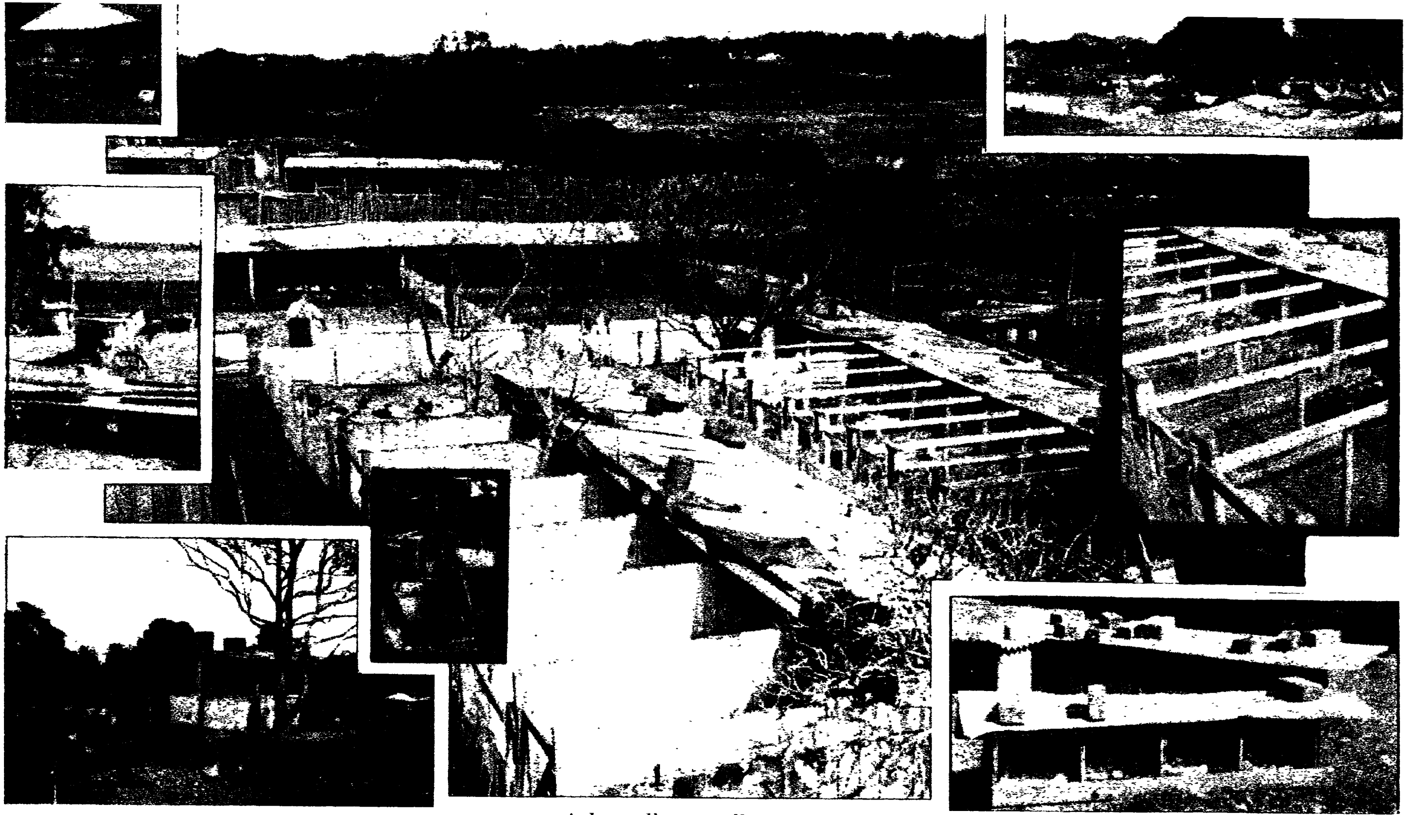
Cost of preparing, say a day's work in all, 7s.; applying, £1; making an outlay of some £2 per acre for the season.

For tomatoes, cucumbers, marrows, and rock melons, there can be no question about the commercial advantages of the treatment. The increased returns obtained in carefully-conducted trials have been found to be as high as 50 per cent. Another thing is that, where periodical spraying is practised, you are able to keep off insect marauders, such as cutworms, grubs, and beetles, with Bordeaux Mixture, that adheres to the foliage and makes it and the ground unpleasant for them.

The spray above described is very much weaker than that recommended by the Department, especially for fruit-trees. At page 915 of this issue Mr. Allen gives details for the preparation of ordinary Bordeaux Mixture.

It might be a good plan where the banded pumpkin beetle is very troublesome to add a little Paris green to the spray, say 1 oz. to 20 gallons. To make the mixture more adhesive a little molasses can be added.

A dusting of freshly slacked lime is very efficacious for cut-worms and leaf-eating beetles that attack melon and pumpkin vines. At the same time such a dressing acts as a splendid fungicide, and in the case of oïdium or vine-mould is almost as beneficial as Bordeaux mixture. To ensure complete covering of the under, as well as the upper surface of the leaves, the lime should be placed in a bag made of course fabric, and beaten with a stick, so that the dust comes out in a cloud, and gently settles all over the plant. The application should be made on a dewy evening.



A DUCK FARM AT ENFIELD

View of the yards; 2. Setting nests; 3. Some of the pens for young stock; 4. The laying ducks; 5. Boilers for preparing food: 7. On guard; 6 and 8. Cement-cask nests

A Duck Farm at Enfield.

W. H. CLARKE.

Some time ago Mr. Campbell described in the *Agricultural Gazette* how Mr. S. Ellis, of Botany, conducted his duck farm on successful lines. In this article, at the suggestion of Mr. Thomas, M.P., an attempt will be made to give some idea of the system of duck-farming adopted by Mr. C. Cooper, at Enfield. The farm comprises some 4½ acres of brick-clay land a couple of miles from Strathfield station. The place is skirted by a creek that is kept on the trickle by overflow water from the Potts Hill Reservoir. At Mr. Cooper's front door there is an electric street lamp, and throughout the premises the "city" water is laid. Thus it will be seen, that to carry on his operations, it has not been necessary for this farmer to go right into the back blocks. People often ask, when poultry farms—especially duck farms—are mentioned: "But is it not such an evil-smelling place, and do not the ducks make such a din that you cannot carry on where there are neighbours within half a mile?" The writer does not quite know. He has recollections of places where the rearing of large numbers of fowls, ducks, and pigs has been carried on in conjunction with a boiling-down establishment, and would just as soon forget all about them. But at this Enfield farm, no one passing along the quiet, suburban road would even suspect that behind a tinned fence on the one hand, an endless succession of young ducks are being reared, and not 50 yards from the gateway on the other side, 1,000 laying ducks are disporting in the creek, while twenty or more pigs of all ages root contentedly in little yards and stys scattered about the place.

Mr. Cooper was formerly a brick-master. That he used to ride as a hobby the care of a yardful of fowls shows that when, seven years ago, he determined to devote himself entirely to poultry-farming, he had as part of his stock-in-trade the most valuable thing that any man can put into a business of the kind—a natural liking for the work. It is the same "natural liking" that can be held forth every time in explanation of the reason why old Mrs. So and So, who dotes on her half a dozen barnyard fowls, beats so many egg records. But Mr. Cooper is not quite content to keep a watchful eye over the welfare of every member of his flocks; he has a motto: "Cleanliness of food, water and surroundings," and with ceaseless industry, seven days a week, and 365 days a year, he carries it out to the letter. His whole seven years' experience can be summed up in that. It must not be supposed that Mr. Cooper achieved success from the jump. For years his venture trembled in the balance, and at the price of loss and much disappointment he solved, point by point, the art—and it is an art—of raising and marketing something like 80 per cent. of the eggs set.

Hatching.

Mr. Cooper has tried incubators, but finds for his purpose that turkeys, Muscovy ducks, or hens are the best. Just at the present time of the year he is out of turkeys and hens for sitting, so all the eggs are under Muscovy ducks. Some of these are located in various yards in terraces of brick nests with galvanised-iron roofing; others comfortably sitting in cement casks, which Mr. Cooper finds excellent, and intends to use altogether.

Young Stock.

For the young stock a series of carefully-drained snug little houses and yards are provided in a row. Mr. Cooper lays particular stress upon the necessity for keeping these places absolutely clean. The interior of the house and the dividing fences are limewashed periodically, and the yards, which are spaded over from time to time, are frequently sprinkled with slacked lime and kept covered with a liberal dressing of spent tan bark. The result of this is that the yards never become sloppy, and there is an entire absence of the sour odour that usually permeates a duck pen. In a prolonged wet spell Mr. Cooper "bobs" the tails of the ducklings, but does not make a general practice of it. The pens are arranged in a way as to make continual supervision easy, and every week the young birds are drafted, all forward enough being put in the next pen. Each pen is supplied by a patent automatically filled water vessel, and the food is placed in a sort of little trough.

Marketing Yard.

In their third month the ducklings are ready for the marketing yard. This is a good sized enclosure dressed with hard material, coal ashes and tan bark, until the surface has been raised some inches above the surrounding land, and is even in the wettest weather always firm and clean. A wooden, canoe-shaped drinking trough, supplied from a tap, is set in a bricked space, and from it there are a couple of brick drains that effectually carry off all the waste water. The whole length of the weather side there is a skilling-roofed shed, plentifully spread with tan bark, in which the birds awaiting disposal can shelter.

Food.

Mr. Cooper has only one opinion about food—it must always be fresh, clean, highly nutritious, and plentiful. For his birds he uses some 200 tons per annum of pollard, oats, and barley meal, with about 100 loads of absolutely fresh slaughter-house scraps, as well as about 50 loads of cabbage, lettuce, and other greenstuff.

The ration, fed morning and evening, comprises one-third meat stuff and two-thirds meal. For preparing the food, there are several well-fitted boilers under a shed. The meat is boiled to shreds; all the tallow is skimmed off and poured into a half-tank, whence it is placed in casks and sold as a by-product. With the shredded meat the meal, and latterly a sort of jam factory refuse—sweet, cooked stuff, which appears to be the remains of apples from which the jelly has been strained—is mixed. All the ducks get a liberal share, and before the next meal all that they have not eaten is gathered up and fed to the pigs. These animals are merely kept to consume the waste, and under the system the ducks can eat whenever they feel inclined, while there is never fear of their suffering from the consumption of sour food.

Mr. Cooper appears to regard greenstuffs for ducks in the nature of medicine. He always feeds it sparingly, with the best results; once, or at most twice, a week being in his opinion ample for this class of food.

The laying ducks—of which we saw a flock of a thousand—have access to the creek. In a more closely-settled district this would be out of the question; but up to the present time no drainage finds its way into the stream, and the water in it is clean and never becomes stagnant. On the banks of the creek there are little clumps of bushes—tea-tree, lillypilly, and weeds—and there is a nice little sand-bank, where the ducks can dibble in shallow water and nestle in the shade. The layers are so comfortable here that they do not give any trouble. The breeders and sitting ducks, as well as the young ones, however, are all kept well supplied with city water, and the troughs and drinking fountains are kept as clean as possible.

Shelter.

This is a most important feature, and is provided in every pen in the shape of iron-roofed sheds, lean-to's made with mat-roofs of tea-tree, and fruit-trees planted in the yards. These latter receive great care, and besides bearing quantities of fine fruit, provide good shade in summer for the ducks, and give the yards a pleasing appearance.

By the exercise of the utmost care, as regard cleanliness of food and surroundings and shelter from sun and draughts, Mr. Cooper is able to keep disease at bay. But like nearly all keepers of poultry, he has suffered from the visits of thieves. On one occasion he lost 200 ducks in this way, and his remarks about the necessity for dealing drastically with yard-robbers are very emphatic. To protect the place there are a large number of dogs stationed in the yards and sheds. The one shown in the illustration is an average specimen. It is big enough and sufficiently ferocious to eat a man; but, all the same, the need for such a pack is a pity, because their maintenance and registration must be a very big item, which the annual sale of a couple of hundred ducklings would scarcely cover.

Mr. Thomas, M.P., who accompanied us to the farm, said that near his place a person dependent upon the returns from a few fowls and ducks had not long ago been robbed of almost the entire stock. Most poultry keepers will have noticed in the papers lately that in the western suburbs some 2,000 fowls, ducks, and geese had been stolen from various owners within a fortnight. A couple of years back, orchardists around Parramatta suffered enormously from the night raids of thieves who came from the city with dealers' carts in which to carry off the spoil. One man took the law into his own hands and got into serious trouble for it, but the decision of the S.M. at Parramatta, who sent a fruit-thief to gaol for the fullest term allowed by the law without the option of the fine that he might have paid from the proceeds of the stolen fruit, put a temporary, if not an effectual, stop to the evil. It is to be hoped that some steps of a similar nature will be adopted in the case of poultry robbers.

Fowls.

In a separate part of the farm a flock of about 600 fowls are kept for eggs and raising young table-poultry. A great many breeds and crosses have been tried, and, as the result of many years' experimentation, Mr. Cooper gives the Indian game–Orpington cross pride of place for all-round utility.

Marketing and the Board for Exports.

The young stock raised for market are nearly all cross-bred; they mature sooner, and are generally hardier and cheaper to fatten than pure-breds. For laying, ducks of the Aylesbury and other pure breeds are kept without drakes. The breeders are kept in pens all the time.

As already mentioned, the table-birds are disposed of at twelve to thirteen weeks. The layers are kept till their third year, and then fattened, to meet a fairly steady local demand for heavy-weight ducks.

Some years ago Mr. Cooper tried exporting ducks to West Australia and elsewhere on his own account. Once he realised a big return, but, taken all in all, his success was not encouraging. Since the development and supervision of the export trade in poultry by the Board for Exports matters have been different, and to quote his own words: "If it were not for the action of the Board for Exports, poultry-farmers like me could scarcely expand our business. Our stock comes on with a rush, and, with a restricted local market, prices have fallen, and would do so again if it were not for the Board's efforts, to a rate that would not cover feed. The Board helps us over this difficulty and charges us for the work, but the result is a good uniform return for all our stock, and the saving of the time that in a business like this that you cannot take your eye off for a day, we cannot spare to potter round fixing-up the dressing, freezing, and export arrangements for ourselves."

As to the effect of a big export trade in poultry on the pocket of the local consumer, Mr. Cooper is of opinion that buyers everywhere are always willing to give a fair price for a first-rate article, and in poultry-farming it is merely a waste of time and money to raise any but first-class stock. So far as he can see, no one gains any advantage from a heavily-glutted local poultry market. When the prices fall below a certain level, the farmer cannot afford, as a pure matter of business, to give the stock proper care and food, and, accordingly, the consumers get an article that is as low in quality as the price they pay. Moreover, from the poultry-farmers' point of view, some provision such as that made by the Board for Exports is indispensable. Some kinds of stock can be held for a better price, but that is absolutely out of the question with ravenous young ducks or fowls.

Pigs.

Reference was made above to the pigs Mr. Cooper keeps to eat up the unused poultry food. In answer to an inquiry as whether that branch of the establishment paid, he waved his arm enthusiastically. "Pay; I should rather think they did. See, they just get the leavings—clean and sweet, of course—with the soup from the boilers; in their pens there all the time, they don't give any trouble; stuck right close to the house here they are not a bit offensive; and I tell you what—with fifty sows and 10 acres of ground, I would undertake from my experience here to make £1,000 a year." And to look at the way Mr. Cooper runs his place, no one would doubt it. The meat-bones boiled as clear as a smelt are neatly piled in a heap to accumulate until there is a load to go to market; the tallow stowed in a nice clean tallow cask, and kept in a condition likely to attract a buyer; the daily removal of yard-sweepings, which gardeners get for the carting; the planting of trees in the yards for shade—all these details reveal a determination to succeed by the adoption of sound business methods.

PHYLLOXERA.

THE Hon. the Minister has decided to effect a change in the methods hitherto pursued in dealing with phylloxera in vineyards. If it were probable that phylloxera could be thoroughly eradicated the Government would willingly go to any reasonable expense to do it, but in view of the fact that there is no chance of doing this in certain infected places, the Minister thinks it will be far better to encourage growers to replant their vineyards on stocks that will not be injured by the disease. With this end in view, the Department has, during the past two years, imported a large number of these vines, rooted cuttings of which can be obtained on application to the Department.

The following are the boundaries of the zone in which the extinction system will be given up:—

Camden: A 5 miles radius from the town of Camden.

Cumberland North: Railway line, Blacktown to Sydney.

Cumberland West: Flushcome-road, Dog Kennel Road, Cowpasture-road, Great Southern Road, to junction of Camden zone.

Cumberland South and East: Leaving this Camden zone, the south-west boundary of the Cumberland zone will be marked by a straight line from Camden to the ocean, Port Jackson being the eastern point.

No vine-cuttings or rooted vines will be allowed to be sent out of this zone, but grapes may be sent out provided no leaves are packed in the cases.

Should phylloxera be discovered outside this zone, the extinction system will be pursued for the present, so that, if possible, the disease may be stamped out before it has secured a firm hold in a district.

Crops for Improving Cereal Land and Feeding Stock.

In some seasons when sheep are cheap it is not much use bothering about sowing a crop after the wheat or oats are harvested to top off animals for the butcher. But this season there is like, for obvious reasons, to be a bit of a boom in sheep, and the good prices that are almost certain to prevail will enable the holders of thousands of acres of cultivation paddocks that lie weed-stricken, baked and unproductive from one year's harvest to the next season's sowing, to turn over a goodly sum and at the same time clean their land of noxious vegetation and put it into better trim for the next crop. In the coastal districts lots of paddocks will be free this and next month, and if the land can be roughly worked up soon after the harvesting of the crop and before the sun and dry winds have baked the surface like a road, a crop of rape, mustard, cow-peas, perhaps turnips, oats and a lot of other things that will fatten sheep and do the land more good than harm can be put in at small expense.

It is unquestionably true that thousands of tons of hay and hundreds of thousands of bushels of grain are lost every season by the foulness of the land and the lack of stimulant in the shape of natural fertilisers distributed in the way that only depastured animals can do it.

A good many people are afraid to have anything to do with the sheep most suitable for fattening on cultivated crops in the coastal and table-land districts on account of their roving habits. During the trials carried out at the Hawkesbury Agricultural College Farm last year, Mr. Valder showed pretty conclusively that if the precaution were taken to supply the animals with an easily accessible supply of dry feed in the shape of straw chaff, ordinary fences would keep them within control. Immediately the supply of dry feed ran short, however, the crossbreds would bore their way through anything to get at a few clumps of dry grass, and having satisfied the craving, would return to the cropped paddock at once.

A good crop ought to carry six or seven sheep to the acre, and even if sheep were hard to obtain, and long prices had to be paid for them as stores, the returns and the improvement of the land should tot up to something like a profit of a couple of pounds hard cash per acre for the six or seven months under the poorest conditions.

Some weeks ago Mr. D. Hanna, of Gumeracha, had in one of the leading Victorian agricultural weeklies a very well thought-out paper bearing to a great degree on this phase of the subject, more especially on the necessity for farmers generally to increase the stock-carrying capacity of their holdings with a view of getting better returns from the land. His remarks, reproduced *in extenso*, are certainly worthy of careful perusal :—

"The growing of fodder for stock and cleaning the land are subjects that do not receive sufficient attention. Wild oats, sorrel, and stinkwort are gradually taking possession of the land in this and similar districts, and to exterminate them we must either spell our land or else increase the acreage of fodder crops. Where sorrel or wild oats have firmly established themselves it is impossible to grow a clean or heavy wheat crop, especially when the farmer has the same portion of his farm under crop for a number of years in succession and still adheres to the system of simply ploughing and sowing his land in April or May. Stinkwort has no apparent effect upon a wheat crop, but considerably reduces the grazing value of land for several years after it has been thrown out of cultivation, and also increases labour at seed time.

"To assist in the eradication of wild oats the land should be worked with a scarifier, spring-tooth cultivator, disc or skim plough, immediately after harvest, so that the oats and other seeds may be covered. With the first good rains they come up, and may be kept down by sheep or cattle till April or May. If it is then necessary to put this land under crop, a very early variety of wheat should be sown, and cut before the wild oats are ripe. I grew a wheat (the earliest of all) which, except for the weakness of the straw, was all that could be desired. This, I think, is the great fault of all very early wheats. Should the farmer prefer to cut a self-sown crop from this land instead of sowing it in May, it should be cut down for ensilage, the land ploughed immediately afterwards, and sown in drills with maize or sorghum in October, using the cultivator between the drills later on. If the crop were left for hay this could not be done, and it is probable that either the seed would fall on the land, or there would be great difficulty in saving the hay, owing to its sappy nature and unfavourable weather usually experienced at that time of the year. I have little faith in feeding green fodder to stock in winter; far better results would be obtained if more attention were given to the growth of fodder to be fed to or grazed by the stock during the summer months, when the natural grasses are dry.

"Land that has received previous summer cultivation sufficient to start oats and other weeds can be made fairly clean by ploughing it in September, working it down to a fine tilth, and sowing it the same month with 3 lb. or 4 lb. per acre of broad-leaf Essex rape, Kangaroo Swede, or other turnips. The seed should be mixed and sown with the manure at the rate of 1 cwt. or 2 cwt. per acre, according to the quality of the land, and sown in drills 14 inches or 16 inches apart. This can very easily be done by closing every other drill. Roll the land before drilling, and let the hoes work without any pressure except their own weight; follow with a roller or light harrow. When the crop is 4 inches or 5 inches high, run the horse-hoe between the drills to destroy weeds and assist the growth of the plant, which should have had sufficient manure applied to give it a good start. Last September I sowed 9 acres of rape, and fed it off twice with sheep before February.

There was a good crop in April, which was partly fed off by cattle and sheep, then ploughed in, and wheat sown on the land in May. The sheep did exceedingly well, and came off it in prime condition. Last season was an exceptionally favourable one for this crop, good rains being frequent up to January, followed by early rains. Kangaroo Swede turnips, sown at the same time, did well with me, and may be carefully grazed with sheep for three or four months; cattle or pigs will then eat the roots, if turned upon the crop. Mustard grows faster and is preferable to either rape or turnips for sowing land immediately after the hay crop has been taken off. For dairy cows, maize or sorghum should be sown, but the crops previously mentioned will enrich the soil to a greater extent, especially if they are ploughed in green at seeding-time.

"Owing to the low price of wheat, it is important that farmers should increase the stock-carrying capacity of their farms by utilising a larger area for the growth of fodder crops, especially on small farms where the land suitable for cultivation is limited. If a portion of the farm were sown with sheep-fodder each year it should be made sheep-proof; do not turn sheep or cattle on the crop when they are hungry or when the crop is wet, nor should it be grazed too bare, or the crown of the plant will be injured and will not grow again. This applies to turnips also. Cattle are fond of it, but cows in milk should not be allowed to eat much, or it will impart a strong flavour to the butter. Lucerne is one of the best fodders that can be grown; it is beneficial to the land, stock are fond of it, and no other hay is equal to it as a food for dairy cows, but it will not stand constant and close grazing. The best results will be obtained where it can be top-dressed yearly with farmyard manure, and the crop mown for hay; treated in this way, it will produce a large amount of fodder annually for many years. There are other fodder crops that could be grown, but those I have mentioned are the most reliable and, I feel sure, would give the most satisfactory results at the least cost. If we adopt the system of cultivating our land immediately after harvest, sorrel and stinkwort will be considerably lessened, and wild oats and other weeds will start growth with the first rains. Land treated in this way, and ploughed and sown with a fodder crop in spring, is the most effectual method of eradicating wild oats, while at the same time the stock-carrying capacity of the land is increased."

Treating Old Wheat Land.

Under this title in May last, a contributor to the Melbourne *Leader* gave the following particulars of a method he had successfully adopted for the restoration of worn-out or weed-infested wheat land:—"The year 1897 was, as most farmers will know, one of the driest years in the history of agricultural Southern Riverina. Notwithstanding the extreme rigour of the season, we had a highly satisfactory crop in a paddock of 150 acres; 20 acres of oats yielded almost 32 bushels per acre. In some places so dense was the crop that it gave the binder all it could do to take it. In some patches, however, the straw was very weak and papery, owing, no doubt, to some chemical want in the soil. The wheat yielded 21 bushels 22 lb. per acre; 70 acres of Steinwedel and 60 acres Purple straw—there being but a trifling difference in the yield of the two. In most cases the Steinwedel proves itself much the superior wheat. Many crops in this district were not harvested at all, and stock was run into them in order to turn them to account. The abovementioned paddock is made up of different portions of land, cultivated at different periods. Some parts have grown nine, others seven and eight crops. In 1895 it was fallowed about 5 inches deep and turned up rather roughly; it was harrowed later on, and sown down with rape in the following summer. The rain came early, and the rape grew well, as did a mixed crop of cockspur and wild oats, for the land was dirty. This was fed off in the spring of 1896, and the ground again fallowed in August, this time turning over tolerably fine. In October it was disced with a heavy double disc pulled by eight horses, and had a good cutting up. In 1897 it was ploughed again before the rain, and sown about the 1st May. A stroke of the single disc and a light cross harrowing completed the process. A lighter implement might have been substituted for the heavy plough; it would have saved a deal of labour, and, I believe, would have been beneficial in retaining moisture. The grain obtained was of good milling quality, being bright and hard, but was pinched considerably, which no doubt greatly reduced the yield of the crop. The first rain fell on the 18th June, and in August, the weather being favourable, crops grew at a rate seldom seen, crops being very forward for the time they had been growing. Rain fell on the 28th September to the extent of 75 points, and then a dry spell set in, and we find crops suffering from drought, particularly so on account of their quick and luxuriant growth. On through October and November the rainfall was very meagre. The last shower fell on 12th November. The stripper was at work in the wheat on 3rd December, the oats having been cut previously. It will thus be seen that the crop had only from the 18th June to 3rd December to germinate, grow, and ripen. The ground has since been clean and free from weeds. Had the drill been used in place of the broadcast sower I am confident that the result would have been better. The drill is only making its appearance here quite lately, and I do not think that there was one in this district in 1897. I have not the exact rainfall for the year at hand, but believe it was somewhere about 12 inches. In conclusion, the best crop we had, next to the above, was 12 bushels, and only a little piece at that, the average for the whole crop being about 10 bushels (for 900 acres). With the present system of fertilising and the use of the drill great improvement can be made on the above.—BOUGWAN, Berrigan, Riverina, 23rd May, 1900."

The advantages of cropping wheat-sick ground with rape have been discussed from time to time in the *Gazette*, especially by the late Mr. J. L. Thompson, who always declared that in a rape-pasture combination the wheat-grower had a cheap and effective means of maintaining almost indefinitely the productiveness of his wheat paddocks. Mr. Geo. Valder favours the growth of leguminous crops, such as cow-peas or something that will produce an abundance of green fodder and at the same time benefit the soil by the addition of nitrogen—deficiency in which is chiefly responsible for wheat-sickness. The rape crop is certainly the cheaper to put in so far as initial expenditure for seed and sowing goes, but the leguminous crop has so many advantages to commend it that it would be well worth the while of farmers whose wheat land is going off to try a patch of, say, cowpeas. Late spring is the time to sow, and by the time the really hot weather sets in there will be an abundant growth, under anything like decent conditions, that will carry as many or more sheep per acre as rape. Provided that the cowpea vines once get a chance to spread they will cover the ground so densely that weeds will have no opportunity of growing. In the following autumn when the sheep are removed and the land broken up the soil will be in the best of condition to produce a good crop of grain. In trials at Wagga Farm the black cowpea, which is regarded as the strongest grower, sown early in October, was ripe for harvesting for pulse at the latter end of December, so it can be easily understood that the returns from such a crop are quick. If sown in drills 7 to 10 lb. seed will suffice for an acre; broadcast, from ½ bushel to 1 bushel is required. The yield of seed will run on an average to over 20 bushels per acre, so that if a farmer were to establish a seed-plot of an acre or two it would be possible to raise and have always on hand enough seed to sow a large area.

THE ESSENTIALS IN ROOT-CROPPING.

THERE is no crop in which moisture is of such absolute importance as the root crop. The smallness of the seed and the comparative weakness of the shoot necessitates the seed being deposited under a very shallow covering. The moisture, therefore, has to be induced to come very near to the surface, or the seed will not germinate, or having been germinated by a shower, it may malt. Having got to the surface the young shoot requires to be sent along rapidly to have vigour to combat the fly and disease. Unless there is ample moisture, growth is so slow that the pests succeed at the expense of the crop.

To ensure moisture a genial tilth is necessary. If the seed is sown among small nubbly clods, much of it sinks away so deeply that it cannot grow; moreover, moisture is with difficulty brought up. In such a case, harrowing as a final operation after drilling is not usually so beneficial as rolling, as the closer the particles are compressed together the better.

But when the soil is damp, and there is a prospect of rain shortly, harrowing is very often more beneficial than rolling. When the surface is rather rough, and the tilth good and moist below, it is often desirable to leave the coulter-marks open. A small piece of chain hung on the coulter to trail behind to cover the seed, and to leave an even wider coulter-mark, often effects a good purpose. In fact, the final operations call for very close attentions, and it is not by any means rare that trouble is caused because exactly similar workings are allowed irrespective of conditions.—*The Cable.*

Farm Notes.

NORTHERN RIVERS DISTRICT—October.

H. V. JACKSON.

Cane-crushing at the mills will now be in full operation, and those who desire to plant new areas with cane, whether for sugar production or for feeding stock, will require to plant cane sets as soon as possible if the weather is at all favourable. The dry spell prevailing in August and September was severe, and retarded planting operations generally. In view of dry conditions possibly still prevailing, when preparing the land deep tillage will prove helpful to the future maize crop. With dry conditions similar to those we have had of late, early sowings of maize give disappointing results; but provided there are seasonable showers, October sowings should turn out well.

Those farmers who have Algerian or other varieties of oats sufficiently forward may endeavour to make some oaten hay. Hay-making should be done when the crop reaches the best stage for curing, just before the seed has matured, or when it is in its milky stage. Care should be taken not to dry the material too much, but to have it just cured enough, as there will be a loss of nutritive matter if over cured. Rye cut for dry fodder also requires much care, and should be well turned over, and quickly stored, otherwise it becomes hard and not so palatable when chaffed.

Potatoes will require to be well mulched, especially if the "dry spell" continues, and when a flush of rain does come, beware of the insect life that will follow and attack the foliage of potatoes, melons, pumpkins, and most vegetables. Wood ashes or air-slaked powdered lime, blown into the foliage by means of a bellows, checks the depredations of the so-called "lady-birds."

French or Kidney Beans may be sown; they are a reliable vegetable for a portion of the summer time. There are the Scarlet Runners, the Snake Bean, the Lima, and Mont d'Or or Golden Butter Bean. So soon as the French Beans are producing their pods, take the opportunity to gather some daily for cooking while they are young and tender. If peas and beans are allowed to ripen, the plants soon go down and cease bearing. Where sweet potato vines have made some growth, cuttings about 12 inches long should be taken and planted a little more than half their depth in the ground where they will soon root and form tubers. Plant out a few leeks in well-manured ground; plant the bulbs well down in shallow trenches. If you desire to blanch the leek, the earth is drawn up to the plant, but if you do not desire to blanch the stems, then they may be grown just the same as onions, only the plants must be at greater distances apart.

When the vines of melon and cucumber plants begin to run, pinch off the shoots so as to cause them to make laterals.

Those who followed my advice to grow Madagascar Beans and Silver Beet as a good stand by in the vegetable garden, have not been disappointed. When ordering Madagascar Beans for sowing, ask for "Dolichos lab-lab." Grow them on a trellis or fence.

Plant out tomatoes. Varieties that gave excellent results last season were: Golden Sunrise, a large luscious yellow tomato, Fordhook Fancy, Large Red Smooth, Table Queen, Mikado, Optimus, Trophy, Crimson Cushion. When the tomatoes are bearing look well over them, and remove all fruit showing signs of disease, and destroy them. Sow pumpkins and melons. The best table varieties grown here have been Ironbark, I.X.L., and Crown. The Large Button, Calhoun, Jonathan and Turk's Cap are also good sorts.

Varieties of squash are numerous. I think Marblehead is if anything the best of all, though of course it is much a matter of taste; the Mammoth Crookneck is very excellent, also Boston Marrow and Improved Hubbard. Of the small varieties Delicata is perhaps the best. The Early White Custard bears well and is very nice.

In marrows the long fruited White Bush, Custard Marrow, and Rice Marrow give good results.

For Cattle feeding, the large Cattle Grammas gave best results here, and stock are very fond of them. Sow amber cane, Planter's Friend, millet, and buckwheat. If the weather is moist lucerne may be sown.

Banana suckers may be planted, also pine apples. Grape vines will be making strong shoots, and these shoots require to be tied up carefully as they grow to prevent them being broken off by strong winds. Occasionally apply sulphur, or spray with Bordeaux Mixture. Keep the orchard as free from weeds as possible. Take the opportunity to shape the young fruit trees by removing unnecessary shoots and pinching back others. If the sap is up, budding of citrus trees may be done.

RIVERINA NOTES—October.

G. M. McKEOWN.

Sorghum.

Seed should be sown without delay in land which has been deeply worked and thoroughly pulverised.

The deep soils of the river frontages will give the best results; but wherever practicable, irrigation should be applied should the growing season prove dry. As the rainfall, so far, has been good, fair results may be anticipated.

Seed should be sown in drills about 3 feet apart, to admit of tillage being carried out during the growth of the crop. Eight to 10 lb. of seed will sow an acre. The best varieties are Planter's Friend and Amber Cane.

Maize

May still be sown to produce a crop for green fodder or ensilage. River flats, deeply worked, will give the best results, the higher lands being unsuited to the crop.

Cow-pea

Should be soon in drills for seed production about 3 feet apart, using about 20 lb. of seed per acre.

For feeding off or ploughing in, 45 lb. seed per acre should be sown. The black and clay-coloured kinds are the best.

Millet.

Hungarian for hay or green fodder should be sown in finely pulverised soil, using about 15 lb. seed per acre. The Japanese variety has also given fair results here.

Pumpkins and Squashes.

Sowing should be completed without delay.

Alluvial flats should be selected, and the land deeply and finely worked.

The seed should be sown "on the flat," and not in raised mounds, as is sometimes done. Well-rolled stable manure should be used on the land, and the surface should be well mulched round the plants.

Running varieties should be planted 10 feet apart, leaving three or four plants in each group. Bush varieties may be sown 6 feet apart.

HAWKESBURY DISTRICT—OCTOBER.

GEORGE VALDER.

Maize.

The cold nights experienced during the early part of last month did much to deter farmers from early sowing, but, thanks to the warm showery weather which we have had since, there is every chance of the crops getting a good start.

The weeds also are coming up very strongly, and therefore the early-sown maize crops should receive a good share of attention, being either harrowed or lightly cultivated between the rows in order to check the weeds and assist in retaining the moisture in the soil. I would strongly advise shallow cultivation for maize, more especially with the early crops. During the moist weather in spring the young plants sent out large numbers of roots at shallow depths, and these are to a great extent disturbed by deep cultivation, and the yield is often thereby much reduced. If, however, the seed is planted at the bottom of the furrow, and the land is well harrowed as soon as the young plants are a few inches high, no harm will be done to the plants, as their roots are at a safe depth; but the weeds will be destroyed, and the soil left in good condition.

Seed Maize.

There has again been great demand for pure seed, especially of the quick-maturing varieties. From the reports received regarding the American varieties, the seed of which the Department imported last year, it appears that several of these are well suited to many of the maize-growing districts of this Colony; and, on the publication of reports in last month's *Gazette*, numerous applications were received for trial packets of some of the varieties.

Maize is, perhaps, more prone to cross fertilisation than any other cereal; hence, if the farmer grows more than one variety, there is always a danger of mixing. This danger, it is true, can be mitigated on large estates by planting each variety some distance apart; but even then there is still danger of mixing, as the pollen is carried long distances by bees, and also by birds. I would strongly advise farmers to set aside portion of their maize land for growing seed, choosing a position as far removed from other maize crops as possible. Sow and cultivate this carefully, and when the crop is ripening go carefully along the rows and cull out any of the plants that are not true to the type, and those that do not bear well. When the crop is harvested, cull out any of the cobs that are not well-formed or appear to have been crossed. Also, when the corn is shelled, sift out the small grains, and sow only the large plump seed. If this system of selection is adhered to, the variety will not only be kept true to type, but it will be improved both in yield and quality. Other causes of deterioration are the use of immature seed and the growing of the same crop year after year on the same land. The plants intended for seed should be allowed to thoroughly ripen before they are harvested. As maize will stand longer in the field than any other cereal, the plants can nearly always ripen their seed in the field without being its injured. Change of land and seed can be obtained by getting a farmer in another district, where the climate and soil differ from your own, to cultivate a small quantity of the variety or varieties you are raising for a year or so, and then exchange seed with him. Exchanging seed will in many instances improve the crops, and therefore benefit both of the growers. There is, again, a large demand from the farmers in the inland wheat-growing districts for early-maturing varieties of maize. During the ploughing season maize is used extensively for horse-feed by the large wheat-farmers. This maize often costs a fairly high figure, as to the market price must be added in many instances heavy charges for freight and cartage. In most of these districts only quick-growing varieties can be successfully grown, and so far the following varieties appear to have given the most satisfaction, viz., Ninety-day, Queen of the Prairies, Longfellow Dent, Pride of the North, Iowa Gold Mine, and Star Leaming, all of which are yellow-seeded varieties. Of the white-seeded ones Hickory King and Iowa Silver Mine are the most promising. The listing system should be adopted as in nearly every season, unless the rainfall is a very heavy one, crops sown on this system give the best results.

Sorghum.

The main crops should be sown this month. Sorghum can often be successfully grown on lands that are too poor to grow corn. Although it is generally regarded as a heavy feeder, it often can be grown in rotation with corn or other cereals, as it is a deep feeder, and if not grown more than once on the same land leaves the soil in good condition for corn and other surface-feeding cereals. Sorghum endures drought much better than corn, and is grown successfully in many districts of the Colony where corn in most seasons would fail. Although not as good a forage as corn for milch cows, it yields a very heavy crop, and resists drought, and is, therefore, valuable to dairy-farmers.

Broom Corn or Broom Millet,

if not already sown, should be put in at once. The ordinary maize drills are very suitable for sowing the seed, using only a very small quantity and distributing it evenly along the drills. It succeeds very well in this district, and should be a valuable crop if carefully cultivated and hasvested. There seems to be a good demand for the heads, as numerous inquiries are received by the Department from manufacturers for it every season.

Last year several farmers in this and the Penrith district put in crops of broom-corn, and a well-known broom-maker told me that some of these crops which he handled supplied broom of excellent quality, and that the yield was remarkably good considering that the season was a very dry one. Besides the "broom," a large quantity of seed is produced, and this is valuable food for pigs and poultry. The cultivation required is the same as that given to maize or sorghum.

Leguminous Forage Crops.

It is very necessary that more attention should be given to these crops if the farmer wishes to keep up the fertility of his soil; and to the dairy-farmer they are also of great importance in enabling him to feed a complete ration to his cows at a low cost. Professor Robertson, the Canadian Agricultural Commissioner, some time ago published a report, in which he states, that "after years of seeking for a perfectly balanced ration of ensilage for dairy cows, the combination which he has found will give cattle all the nourishment required, at a cost much less than that of ripened cereals or concentrated by-products, is that of maize, horse-beans, and sunflower heads." Now, in all our chief dairying districts maize and sunflowers can be successfully grown as summer crops, but horse-beans can only be grown successfully as a summer crop in the cool parts of the Colony. We shall, therefore, require to find some leguminous fodder crop to take the place of the horse-beans. Cow-peas have proved very successful, both as to yield and quality of the forage ; but unfortunately the crop is an expensive one to harvest, and the vines do not pass very readily through the chaff cutter. Lucerne, it is true, answers well, but the dairy-farmer also requires an annual which he can rotate with other forage crops. In the United States the soy-bean has come largely into favour for this purpose. Although, so far, it has yielded rather uncertain crops in this Colony, I believe that we shall discover one or two suitable varieties among the large number under cultivation. Being an upright grower, it can be cut for forage with a mowing machine, and is easily harvested in every way, besides chaffing well.

Worn-out maize lands can be vastly improved by sowing a crop of cow-peas, and feeding them off with pigs. Tangier-peas, mung-beans, &c., are also suitable for this purpose, and sowings should be made this month. The Lima bean should also be planted, either as a field crop in drills, or as a garden vegetable on trelllis. Splendid crops of this bean have been grown in various parts of Central Cumberland, and in every instance the growers state that it was one of the most prolific and useful vegetables that we have. It should certainly be grown on a large scale, as if all the beans are not consumed when green, they can be allowed to ripen, and the dry beans are most valuable for winter use.

Where pigs are kept, it is a splendid idea to have a plot or two of cow-peas, or other leguminous crop, to turn them into. The cost of such a system is the ploughing of the land and the sowing of the seed, with, perhaps, a bit of attention in the way of a couple of cultivations. The return is healthy, rapidly-fattening pigs, and a paddock enriched by the droppings of the pigs and the residue of the crop.

Pumpkins and Melons,

if not already sown, should be put in as soon as possible. The crops that are above ground should be well cultivated and thinned out. Preserving melons are wonderfully prolific, and although not of high feeding value will be found extremely useful for winter feed, especially if pulped and fed with chaff, cattle and sheep thriving well on them. They are also useful for feeding to pigs. For beetles and bugs spray with Paris green, or dust the plants with lime.

Root Crops.

Potatoes, mangolds, sugar-beet, &c., should now be well above ground, and require careful cultivation, in order to retain the moisture in the soil. Sweet-potato cuttings will soon be ready for planting out. Choose a piece of light sandy soil, give this a deep and thorough ploughing, bring the soil to a fine tilth, and then plough up ridges 4 feet apart. Plant the cuttings along the top of these ridges, about 1 foot to 18 inches apart. Keep the soil between the rows free from weeds, and the sweet-potato plants will soon cover the ground, and in most seasons produce a heavy crop of tubers and vines.

Cotton.

Some few farmers in this district have taken up the cultivation of cotton on a small scale, in order to give it a trial. As a rule, the early-sown crops give the best results. The seed should be put in as soon as the soil is warm enough to cause the seed to germinate quickly, and the young plants should receive constant attention, the weeds being kept down by frequent shallow stirrings of the soil. Later-sown crops are liable to be injured by drought; the young plants require to be kept growing, and if checked, always suffer badly, and the yield is generally much reduced.

Haymaking

will commence this month. Farmers should see that their binders or mowers are in thorough order. The haymaking season is, as a rule, a very short one, and it is necessary that there should be as few delays as possible in the cutting. In this district the hay is sometimes rather slow in curing; it is best, therefore, to make the sheaves small.

Orchard Notes.

W. J. ALLEN.

OCTOBER.

OWING to the excessively heavy rains which have prevailed over many of the coastal and highland districts this year, all weeds have had a good start, and the ground in heavy soils has become hard and packed, and it is therefore desirable that all orchards and vineyards should have had a good ploughing or digging as the case may be, by the middle of September, or at the very latest the beginning of this month. As soon as this work is completed the harrow or cultivator should be kept going so as to keep the land well worked up and free from clods; and after each rain see that the land is stirred as soon as it is dry enough for this work. Use a fine-tooth cultivator, or, after running a coarse-tooth cultivator over the soil, the harrow should be made to follow to keep the surface level.

Some districts, however, particularly those not far distant from the coast and which can depend on the late rains, may with safety plough up to the last of this month, but generally speaking it is best to have this work completed by the first of October. Of course it is understood that this applies to level and rolling country and not to steep hill-side orchards where perhaps if the soil were so loosened much of it would be washed away by the rain. Where this work is delayed into the summer the moist soil is dried out by being turned up and exposed to the sun and wind, while the aim of every orchardist is or should be to conserve as much moisture in the ground as possible.

Where orchards are well looked after, and with an average summer, the present outlook for deciduous fruits promises better than for the past two or three years. Where trees are inclined to overbear, due attention should be given to thinning towards the latter part of the month as it will not pay the grower to produce heavy crops of inferior fruit.

All apple-trees should receive a thorough spraying with Paris green as soon as the petals have fallen, and before the calyx is closed. In applying the solution, use a very fine spray, and do not apply more than just sufficient to cover the leaves and fruit without any running off. In mixing, it is best to add one pound of fresh slacked lime to every pound of Paris green. It will be found that some varieties bloom earlier than others, and therefore it will be impossible to spray all trees at the same time, but during this month all varieties of apples will require to be sprayed for the first, and some the second, time for the destruction of codlin moth. If the apples in previous years have suffered from any of the various fungus diseases which attack this fruit, Bordeaux mixture may be used, to every ten gallons of which one ounce of Paris green has been added—in this way killing two birds with one stone.

It will be well to get the bandages on the trees towards the latter part of the month, and these should be taken off and examined every ten days, and all grubs and chrysalids destroyed by cutting them in halves with a sharp knife carried for the purpose.

Aphis on peach-trees will have to be closely watched, and trees sprayed with either nikoteen diluted or resin and soda wash—the latter prepared a follows: Dissolve 3 lb. of washing soda and 4 lb. of resin over a fire in about 5 pints of water; then add water to make 5 gallons; boil well till the resin is thoroughly dissolved and the mixture is of a dark brown colour, and then take 1 gallon of the mixture to 7 gallons of water and apply milk warm.

Strawberries should receive special attention when they are attacked by leaf-blight, rust, mildew, &c. Spray the plants with Bordeaux mixture as soon as the growth starts, and again when the first bloom opens. Sulphur, if dusted on the leaves and between the plants, will prevent mildew. I would not recommend the planting of strawberries where sufficient water is not available, as without plenty of water strawberry culture will never prove successful. The land should be well drained, and fairly rich in humus, potash and phosphates.

Where passion-vines are to be planted, the work should be pushed forward as early as possible, so as to enable them to get a start before the dry, hot weather sets in. Keep a strict watch on all refills, and if they show signs of wilting, give them one or two buckets of water from time to time until they get a good start.

Disbud all newly-planted trees, leaving good shoots at least four inches apart along the trunk of the tree, and do not allow two or three shoots to start from the same place, as so many have done, but give each branch a separate hold of the main stem.

If the sap is well up, citrus trees may be successfully budded this month. Keep all dormant buds and grafts well disbudded, so that the bud may get away good and strong. No suckers or shoots should be allowed to grow below the buds. It is also very essential that stocks should be cut back properly. The cut should be slanting, being slightly lower on the side opposite to the bud, and it is advisable to stake them, not only to prevent their being blown out, but to encourage a straight trunk. Where grafts have been put on old trees, they are even more liable to be blown off than small ones, and must be tied to prevent it. To do this a good stake should be tied to the branch grafted and allowed to project a foot or more over the end; then, as the graft grows, it can be tied to it.

While working around trees watch for borers on the trunks and branches, as when they are starting their work it is very easy to cut away the bark and find them: in this way keeping the orchard clear of this pest.

If the spring should prove a dry one, it is well to watch all refills in the orchard, and if any of these show signs of wilting give them one or two buckets of water from time to time.

As soon as the vines begin to grow, sulphur them at least once before blooming, for mildew, and twice if the weather is very damp. In the coastal districts it is well to spray them immediately with Bordeaux mixture, and should caterpillars of any kind be eating the leaves, add Paris Green to the solution in the proportion of 1 oz. to 12 gallons.

Repeat the sulphuring from time to time, giving as many as eight applications if the season is at all damp. This will pretty well keep oïdium in check. Keep all vines well disbudded. I have noticed in many small vineyards that this important work is very much neglected. Never allow any branch to grow below the crown of the vine. To do this work properly it will be necessary to disbud all vines from twice to three times.

The following recipe for the preparation of Bordeaux mixture is as given in the pamphlet recently published by the Department on Insect and Fungus Diseases of Fruit and their Remedies:—

Copper Sulphate (bluestone)	6 lb.
Lime	4 lb.

Made up with 22 or 40 gallons of water, according to the season, the smaller proportion being the winter dressing.

Copper Solution.—It is immaterial whether hot or cold water be used to dissolve the bluestone. If the mixture is to be made in a hurry it is best to boil the copper sulphate in water. If there is plenty of time, use cold water; but in this case the bluestone must be suspended in a porous bag (bit of muslin or sacking) as near the surface of the water as possible. If the copper salt is thrown into the vessel and water poured on the top of it, it will not dissolve in a week. When suspended as described it should dissolve in about twenty-four hours.

The sulphate of copper solution when made must be diluted largely before the lime solution is added to it. This is a very important point. If the copper solution is too strong, the precipitate formed is thick and heavy and liable to clog the nozzle of the spray pump. If the copper solution is made by dissolving the bluestone in a small quantity of hot water it should be diluted to twenty gallons before adding to the lime.

Lime.—The lime, which should be freshly burnt, is slacked with a small quantity of water. Slacking on a board is to be recommended rather than in a cask, because if the lime is really freshly burnt there will be considerable heat evolved and the barrel may suffer. Place the whole of the lime on a board and pour over it about three or four pints of water. The lime, if it is good, should become very hot, crack asunder, give off a quantity of steam, and finally crumble into fine white powder. This is now emptied into a barrel and water added. It is not an easy matter to make the whole of the lime into a wash—it cannot be done by simply stirring about with a stick. The best way is to use a shallow tub, so that the lime may be pounded up with the water, all the lumps being broken up. Allow to settle, and pour off the milky solution through a strainer if any lumps are present (into the copper sulphate if wished, or into another barrel) and add more water, repeating the pounding until all the lumps have disappeared.

Mixing.—The mixture must be made by pouring the lime water into the copper solution, and not by adding the copper solution to the lime water.

Mr. Gambling, of Thornleigh, has kindly furnished the following information regarding fruits unsuitable for his district. With this gentleman the following varieties have proved shy bearers:—Five Crown Pippin and Lord Wolseley Apples, and Washington, Fotheringham and Prunus Simonii Plums. I am always glad to receive particulars of this kind, and especially from those growers who have made actual tests as to which particular varieties are suited to certain districts. Soils vary so that it is very difficult to apply any hard and fast rule for each separate locality; but with the assistance and co-operation of the growers a fairly reliable list might be tabulated. I shall, therefore, be pleased to hear from fruitgrowers as to which fruits have been found to do best with them in their particular district, as well as those which have proved failures.

MAKING TENTS FOR FUMIGATING TREES.

THE best material for making the tents is the best quality of duck, marked "Heavy Cotton Duck, Canada D," in an oval. No first-class duck requires to be treated with oil or other similar substance to render it gas-tight, as it is sufficiently gas-tight for all practical purposes, without any such treatment. At the same time, it is advisable to tan both bell tents and sheets by placing them in a strong tan bath—the tanning material used being either wattle bark, ironbark, din-din, or other suitable tanning material. The object of this tanning is to prevent the tents or sheets from rotting, or from being covered with mildew. In the case of the two smaller sizes of bell tents, lighter material, such as strong calico or Mexican sheeting, may be used, provided that it is thoroughly dressed with raw linseed oil; but, though more gas-tight, it will not be as strong or as durable as the best quality duck, as the oil has a tendency to rot the material to which it is applied. If oiled tents or sheets are used, they must be thoroughly dried before they are folded up, otherwise there is every chance of their being destroyed by spontaneous combustion. No. 0 bell tent is made of 5 widths of 36-inch duck, 6 feet 4 inches long, and will treat trees up to 4½ feet in diameter by 5 feet in height. No. 1 bell tent is made of 7 widths of 36-inch duck, 8 feet long, and will treat trees up to 6½ feet in diameter by 7 feet in height. No. 2 bell tent is made of 9 widths of 36-inch duck, 12 feet 6 inches long, and will cover trees up to 8 feet in diameter, by 11 feet in height. No. 3 bell tent is made of 11 widths of 36-inch duck, 14 feet 6 inches long, and will cover trees up to 10½ feet in diameter by 12 feet in height. Even larger trees than those given can be covered by the various sizes of tents by tying in straggling growths, and thus bringing them within the measurements given. In order to cut out the duck so as to get the dome of the tent exact cut off a length of duck according to the size of the tent it is desired to make, and fasten it securely to a floor. Run a chalk line the whole length of the cloth, from centre to centre, and set off cross lines at right-angles to this centre line, with a square at the distance given in the plan. Mark off on these cross lines the distances as per plan, and connect same with a curved line, which is the line on which the cloth is cut. Having cut out one width, it is an easy matter to cut out as many as may be required.

All the sewing can be done by machine, using a strong linen thread (No. 26), and making about ten stitches to the inch. All seams have a lap of an inch, and are sewn with two—or better still, three—rows of stitches. As shown in the plan, the top of the tent (the cap) is circular; and the method of sewing adopted is as follows:—First sew three or four widths together, then sew the top on to them; then add three or four more widths, and complete sewing the top to them, and so on, till you arrive at the last seam; then complete sewing on the top. When this is done, start the last seam at the top and complete the three rows of stitching for a yard or so down, or as much as the machine can take, and continue sewing in short laps until complete. In tents Nos. 1, 2, and 3, an extra circle of duck is sewn on the apex of the tent, and to which is attached a ring of 1½ inch rope, about 5 inches in diameter, with which the tent is placed on, and taken off the tree to be treated. In tents Nos. 2 and 3, four hobble rings are sewn on to the bottom edge of the tent, equi-distant from each other, with which to put the tents over the trees, as the rings of gas-piping used in our first tents have been done away with, and this method of placing the tents over the trees substituted for it. In addition to the bell tents, we use three sizes of sheets, which are approximately 40, 50, and 56 feet in diameter respectively. A 40-foot sheet will cover trees about 15 feet in diameter by 15 feet in height; a 50-foot sheet, trees about 20 feet in diameter by 20 feet high; and a 56-foot sheet, trees about 20 feet in diameter by 24 feet in height. Larger trees require two or more sheets, as sheets above 56 feet in diameter, if made of heavy duck, are too heavy and cumbersome to be worked satisfactorily. All sheets are octagonal in shape, each side being of equal length. These sheets are for the very largest trees.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF OCTOBER.

Vegetables.

THROUGHOUT the greater portion of the Colony during this month, despite hot winds that may occur, the conditions for growing sufficient vegetables for table use are favourable. Great care should be taken in the preparation of the beds to reduce the soil to as fine a state of division as possible; then the seedlings and young plants set out will have a better chance, and any artificial fertilisers used will more readily become incorporated with the soil and sooner become available for the plants' use. If a wheel-hoe is available it should be kept going at least once a fortnight to stir the soil between the drills, and, whenever possible, between the plants in the row. If no water can be spared for the vegetable plot, and the soil is of a nature that rapidly dries out, it would be advisable to mulch the ground. In doing this it is best, if there is sufficient partially-decayed straw, bush rakings, or other suitable material at hand, to cover the whole plot to a depth of about 3 inches while the soil is still damp from a day's rain.

If watering is practised, the applications should be made with discrimination, and always in conjunction with stirring of the surface soil as soon as a crust appears on it. For the production of succulent vegetables the use of a moderate quantity of thoroughly-rotted compost, mixed well with the soil at planting time, and periodical applications of stimulating fertilisers like sulphate of ammonia and superphosphate in solution, appears to be the best method. In preparing the liquid manure, a measure should always be used. For cabbages and cauliflowers a teaspoon of chemical manure to a quart of water, and for tomatoes about the same, with the addition of half a teaspoon of sulphate of potash every two weeks. For things like beans, the crop can be stimulated by an occasional dusting of superphosphate along the drills, washed into the soil by a liberal watering from a pot or hose.

Beans, French or Kidney.—This vegetable is of the greatest value for summer, and a succession of plants should be kept up by sowing seed in moderate quantity occasionally during the month. As I have frequently recommended, different varieties should be experimented with, both of the dwarfs and runners, including the scarlet-runners and snake-beans. The application of lime to the soil, or gypsum, will be found of much benefit to beans. Superphosphate of lime or bonemeal will, either of them, be a useful addition to ordinary farm-yard manure. Sow the beans in rows, about 2 feet 6 inches to 3 feet apart, or even more, according to the height to which the variety sown is likely to grow. Make drills about 3 to 4 inches deep, and drop the seeds from 4 to 8 inches apart, then cover over with the soil taken out of the drills. After this, walk over the rows, and press down the soil with the feet, and complete the work by raking over the whole bed to make it tidy. Tall-growing or runner varieties will need strong, tall sticks, from 6 to 8 feet in height, for the beans to climb up. The usual method of fixing these is by sticking them in the soil on each side of the row, and crossing them at or near the tops, and thus support each other. Sometimes it is found advantageous to sow tall-growing beans in double rows, about a foot or so apart, and then there will be a bean to each stick. Regularity should be practised as much as possible in the vegetable garden, even in fixing up sticks or supports.

Bean, Lima.—This is a most useful bean, and a prolific bearer; but, unlike the French or kidney bean, the seeds, and not the pods, are used. The plants are both dwarfs and runners, and may be treated much the same as French beans, but they will need more space in which to grow.

Beet, Red.—Sow a little seed in drills about 18 inches apart. As the seed of beet takes a long time to sprout or germinate, it is a common practice to hasten this sprouting by spreading the seed between damp flannel, or bagging of some kind, in a warm place. When seed thus treated is sown, it should be watered well when lying in the drill before the soil is drawn over it, unless the soil is moist; for, if dry, and water be not applied, the seed would very likely perish. When the seedlings are a few inches high, thin them out until they stand about 9 inches or 1 foot apart.

Beet, Silver.—Sometimes known as spinach. Sow a little seed, either for transplanting or in drills, where the plants are to stand. The soil should be made very rich, to encourage the growth of the leaves, which are used as spinach.

Cabbage.—Sow a few seeds from time to time, in order to have a supply of young plants on hand for planting out when required. Plant out from the seed-bed a few strong, healthy plants, and avoid any that are weak, drawn, or grown in the shade, for such are likely to suffer from removal, and will take a long time to recover.

Cauliflower.—Sow a few seeds and plant out a few strong healthy plants. Make the soil rich with old well-made manure, but avoid that which is rank and fresh, if possible.

Carrot.—Sow a little seed in drills in land that has been well and deeply worked. It is not well to apply manure for carrots direct, but land that has been heavily manured for cabbage, cauliflower, or silver beet would be very suitable for the carrots.

Celery.—Sow a few seeds occasionally to keep up a supply of plants. Very few will be needed at a time. When the seedlings are 2 or 3 inches in height, plant them out in a well-made bed about 3 or 4 inches apart, when they will grow strong and hardy, preparatory to planting in their permanent places. A few plants on hand that may be suitable should be planted in shallow trenches in heavily manured ground. Plant about 1 foot apart in the trenches. When the celery is nearly full grown, the stalks will need blanching to make them white, tender, and eatable. This can be effected by earthing up the soil round the stalks, or in covering the stalks with boards or anything that will keep them entirely from sunlight.

Cucumber.—Sow a few seeds if it is desired to keep up a succession.

Cress and Mustard.—Sow a patch from time to time to keep up a supply. Make the soil very rich and fine.

Capsicum or Chilli.—A few plants are desirable for those who like hot condiments. There are many varieties, being large and small fruits, some of which are very ornamental. Sow seed in box or pot and transplant the seedlings when large enough to move.

Egg Plant.—Grown chiefly for ornament or curiosity in this Colony, and not much used or liked as a vegetable. Sow a few seeds in a pot or box and afterwards transplant. A variety bearing scarlet fruit is extremely ornamental.

Kohl Rabi.—This is but little used as a vegetable, and at best it is but an indifferent one. Those who are curious to try it should sow and plant as the cabbage is managed.

Leek.—Sow a few seeds in a seed-bed. Any plants which are about 6 or 8 inches or more in height may be planted out in shallow trenches. The land should first be heavily manured, for the leek needs abundance. By planting in shallow trenches it will be easier to earth up the leeks, (for they need blanching) than if they are planted on the flat. Liquid manure will be found most useful. Plant deep in the soil.

Lettuce.—Sow a little seed, and plant out from seed-bed any suitable plants that are ready. Keep them going by watering well if the soil and weather is dry, and apply liquid manure occasionally.

Melon, Rock and Water.—Sow seeds in well-manured ground if a succession be needed.

Okra.—Sow a little seed, and if plants are available, plant them out from 2 to 3 feet apart, in good soil.

Onion.—Sow a little seed in drills; keep up frequent cultivation amongst growing onions, and do not allow any weeds to grow amongst them, especially when they are very young.

Parsnip.—Sow a little seed in ground that has been dug about 2 feet deep. The parsnip is a deep rooter, and needs the soil to be friable to a considerable depth.

Peas.—Sow a little seed now and then to keep up a supply of this useful vegetable. Gather the pods whilst they are young and tender, and allow no peas to ripen on the old vines.

Potato.—Plant out a few good, sound, medium-sized potatoes, free from potato-scab or moth. Manure well, and take care that the soil is well drained; plant about 6 inches deep.

Pumpkin.—Sow a few seeds if sufficient have not already been sown.

Radish.—Sow a small quantity occasionally.

Rosella.—Suitable only for the warmest and most moist districts of this Colony. Sow seeds in pots or boxes, and when the seedlings are large enough plant out.

Rhubarb.—Sow a little seed if plants are likely to be required.

Tomato.—Sow seed and plant out from previous sowings.

Turnip.—Sow a little seed in drills.

Vegetable Marrow and Squash.—Sow a few seeds if more plants are required.

Flowers.

During October there should be a magnificent display of flowers of many varieties, and in particular roses will be most productive. The class known as Hybrid Perpetual should now be at its best. The annual varieties, such as the Banksias, continue to bear their flowers, but will shortly be past their prime. When the flowers have dropped off, the plants may be thinned out and pruned, for the flowers being produced on old wood it is not desirable to prune in winter or early spring. By pruning them now, new wood will grow to bear flowers next year.

Plants of tender habits, such as cockscomb, and all the amaranthus family, balsams, salpigloti, &c., should be planted out without any further delay.

Hedges and edgings of all sorts will need clipping rather frequently, in order to keep them in good order. Chrysanthemums may be increased by cuttings from old plants, and when rooted should be planted out.

General Notes.

GETTING RID OF SORREL, AND THE USE OF LIME.

MOST orchardists in the county of Cumberland and elsewhere have had trouble with sorrel. Where the pest can be nipped in the bud—that is, when it appears in isolated patches, it can be kept under control without much difficulty; but often the patches of best soil become infested as if by magic, and it is years before the last scrap of the weed can be destroyed. Very often where fruit-trees are mulched and the ground about them is not disturbed, the sorrel will be found, at the end of the season, in a dense mat ready to fight with the tree for every morsel of manure. The only plan that the writer has found anything like successful in destroying such mats is to spread fresh lime thickly over the sorrel, and then, when it is sick, fork it out. The operation is, however, too tedious, and in a large orchard would be extremely expensive. It is not, however, only the orchardist who suffers loss by the spread of sorrel. Hundreds of acres of good farm and pasture land are now choked with this pest. In the Melbourne *Leader* recently there appeared, in answer to a correspondent, the following particulars concerning the use of lime generally, and in reference to the rehabilitation of sorrel-infested land, supplied by Mr. Thomas Brydone of New Zealand:—"The company which I represent has been one of the earliest and largest consumers of agricultural lime on the Edendale Estate, in Southland—a distance 85 miles by rail from the Milburn lime-works. Having been reared on a farm in Perthshire, where we had limestone and burned it for our own use, I was early trained to the benefits of it, and have always been a strong advocate for its use. It is some seventeen or eighteen years now since we first experimented with lime on Edendale, and were perfectly satisfied with the result; but the lime was high in price and the railway-carriage so dear that we could not afford to go into liming on a large scale. Ten years ago both were reduced in cost, and we started the business in earnest, and since then we have used 9,500 tons on 4,890 acres, at a cost of £10,261, and are still going on and increasing as fast as we can. We started with liming 200 acres in 1890, and this last year did 1,069 acres, and I can only say that the company never made a better investment."

"The soil of Edendale is a light loam with a sandy clay subsoil resting on gravel. It yielded good crops of oats and turnips for a few years, after being first broken up, but soon became exhausted and turned to sorrel. Grass, also, was all right for a short time, and then got full of couch and fog, and would only carry a very few stock—in fact, we could not make it pay. The liming has changed all this. We get heavy crops of oats at least a fortnight earlier than before. Our turnip-crops have never failed, and average about 25 tons to the acre. We can also grow from 30 to 40 bushels of wheat to the acre, which would not grow at all before; but the principal advantage is with the grass and clovers. The lime seems to kill out and keep down the weeds and foster the grasses which we want to grow. Our manager at Edendale says, 'Lime is the best couch eradicator, with judicious labour, we have yet found.' Without the lime the sown grass would run out in a couple of years; but, so far, we have not required to renew an acre of the limed land."

"We have thoroughly proved in practice that turnips and clovers require lime for their growth, and rape also thrives splendidly after lime. We had a 180-acre paddock this last summer sown with rape, turnips, and Italian rye grass; 90 acres fattened 3,000 lambs after weaning, besides carrying 2,000 stores for six weeks. The other 90 acres carried 350 bullocks for six weeks, and 160 dry cows for longer. The weather was wet nearly all the time, which wasted a lot of feed. The stock eat the rye grass first, then the rape, and finished with the turnips. The rye grass was sown with a view to keeping the ground clean for the lambs grazing, but it afforded a lot of excellent feed, besides serving the purpose it was sown for. The first year's grass of a 240-acre paddock fattened 250 head of heifers from stores, and a second 250 a little better than stores were put on, and it finished off the bulk of them. Before liming it would have been dear enough at 6s. an acre rent. Oats that we have had on limed land have thrashed out 75 bushels, which before only gave 25. We apply the lime at the rate of two tons to the acre, the lime being carted direct from the railway trucks, and put in small heaps on the land, when it is ready to be drilled for turnips or sown with rape or oats. It very soon dissolves, even if there is no rain, and can then be spread evenly with long-handled shovels. We have 700 acres of drilled turnips on Edendale this season, some of which look like 30 tons to the acre; but all are good.

Free Carriage of Agricultural Lime.

"For nearly two years the Government has been carrying agricultural lime free, and farmers south of Dunedin have taken full advantage of the privilege, which has been a great boon to them. Without railage we find the cost per acre to be £1 11s. 6d., made up by two tons at 13s. a ton, 4s. for cartage, and 1s. 6d. for spreading. When I was in Great Britain, two years ago, I found many farmers using lime in small quantities in place of artificial manures—say, 10 cwt. to the acre—and then they would apply another dressing in four or five years, according to their rotation of cropping. They generally use crushed lime, and spread with a machine. The same thing was tried by my company some years ago, with considerable success, only the lime company is kept too busy now to bother with crushing. I should mention that we apply about 1 cwt. of artificial manure to the acre for turnips, to help them to start, and the lime does the rest.

"I have not met a farmer yet who has used lime but speaks highly in its favour. I could get hundreds of testimonials, but I only wrote to one man, who is a well-known sheep-breeder, not far from Milton. He says:—'Before liming my land was red with sorrel, now you cannot find a blade. Before liming I could not grow more than from 30 to 40 bushels of wheat to the acre; since liming, from 60 to 76 bushels, and I would call 50 a small crop. The sample is now quite different, being well matured, and no seconds. Oats, before liming, 40 to 50 bushels, now 80 to 100, and as high as 110. Turnips, before liming, were very poor—in fact, could not grow for sorrel; now I grow nothing but Swedes, as they grow bigger than the ordinary sorts. I also find that turnips grown with lime fatten stock quicker than where no lime has been used. I can now carry two sheep for one before. I consider my farm is doubled in value. If worth £12 to £15 formerly, it is now worth £24.' And he adds a postscript:—'I would not take £30 an acre at present.'

"That will, no doubt, be accepted as very good testimony to the advantages of liming land, and my own experience fully endorses it. I always consider that at Edendale, if we do not get our money back the first year, we get it the second; so what better gold-mine can you have than that? A farmer should insist upon having lime, if within reach and the land suitable. Of course, every soil or climate is not suitable, and the farmer should experiment on a small scale before he goes to too much expense, as it would be wasting money to put it on land that contained sufficient lime naturally, or in a very dry climate."

MEASURING HAY IN THE STACK.

HERE are a few simple rules for determining the amount of hay in a stack or mow, when it is not convenient to weigh it (says the American *Cultivator*). Selling by measurements is not always the most satisfactory method, but it is sometimes the most convenient. Sellers are disposed to insist that a cube of 7 ft. is a ton. This is entirely too small, and will not weigh out. How many cubic feet will make a ton depends on so many conditions that no certain rule can be given. It depends on the kind of hay; on the character of the hay, whether fine or coarse; on the condition in which it was put in the stack, the length of time it has been there, and particularly on the size, especially the depth of the stack or mow. In a very large mow, well settled, 100 cubic feet of lucerne or grass hay may average a ton, but on top of the mow or in a small stack it requires 500 to 512 cubic feet, sometimes even more. It is not safe for the buyer to figure on less than 500 cubic feet, but in a well-filled stack, in selling, it would be safer to weigh than to sell at that measurement.

To find the number of tons in a barn, mow or hayshed, multiply the length, depth, and breadth together, and divide by the number of cubic feet, which, considering the quality of hay and the condition in which it was put up, will make a ton.

For long stacks or ricks multiply the length in yards by the width in yards, and divide the product by 15, and this should give the tonnage. To measure a cone-shaped stack find the area of the base by multiplying the square of the circumference in feet by the decimal ·07958, and multiply the product thus obtained by one-third of the height in feet, and then divide as before, cutting off five right-hand figures. The correctness of this will depend somewhat on the approximation of the stack to a regular cone, and if the stack bulges out it makes the product too small. The better way is to estimate the area of the stack up in the point of tapering in, and apply the rule to the cone-shaped top. The best way is to weigh. The experience of weighing a few stacks will enable any one to judge quite correctly.

Another approximate rule for measuring a round stack is this: Select a place which is as near as possible to what the average size would be if the stack were of uniform diameter from the ground to the top of the point. Measure around this to get to the circumference at the right, and divide the whole by 3·1559 to get the diameter. Now multiply half the diameter by half the circumference, and the feet of the circumference area is obtained. Multiply by the number of feet the stack is high, and the solid or cubic feet in the whole is ascertained. Then divide by the number of cubic feet in a ton, which ranges all the way from 370 to 512, according to the fineness and compactness of the hay. This will give the number of tons in the stack.

THE RENOVATION OF UNPRODUCTIVE ORCHARDS.

IN connection with the notes published last month in respect to the reclamation of neglected orchard lands, the opinion of Professor C. A. Kepper in the *Texas Stockman* may be of interest: "It seldom happens," he says, "that the farm orchard is maintained in full productiveness. From one cause and another, the orchard after a longer or shorter period of profitable fruiting gradually fails; and there are hundreds of orchards which do not pay for the land they occupy. Vitality became seriously impaired by too heavy bearing. The loss of fertility caused by the removal of several crops of fruit is not restored to the land by manuring. Seeding down the orchard, and consequent lack of cultivation, changes the soil texture, resulting in a general weakening of growth. An entire neglect of pruning results in a general thickening of the crown, preventing the free entrance of light and air, important factors in fruit production. Insects and fungi flourish unrestricted. Some or all of these causes are at work in thousands of orchards, and in the aggregate they are causing a very heavy loss to the farmers of the country.

"It is far easier to avoid than to correct the evils. For in trees as in men, there is a formative period that has a far reaching influence in life and character. Train up a tree in the way it should go. The tree cannot safely be left to its own devices thereafter, but much anxiety and toil can be avoided by early training, and after-care is reduced to a minimum where early care has been judiciously bestowed.

"There never comes a time in the history of a fruit tree, however, when it will not require attention if it is to be productive. It must be fed. It must be clothed each summer with good healthy foliage. It must be relieved of unnecessary burdens in the shape of unproductive wood. It must be protected from insects and fungi. Its trunk and branches must be guarded against sun-scald. Its roots must be aided in their work of food gathering by the judicious use of the plough and harrow.

"It is impossible to lay down the law for the regeneration of unfruitful orchards. Not only is each orchard surrounded by conditions peculiar to itself, but no two trees in the orchard present exactly the same problem. A prescription for failing orchards in general would be hardly as valuable as the nostrums of the patent medicine man. Specific diagnosis is necessary; and nobody should be so well able to make a study of the needs of a run-down orchard as its owner. Let him begin his inquiry by a careful examination of the trees and the soil in which they stand. It is hardly to be doubted that the trees have hung out signals of distress which need only to be read aright to enable the cultivator to begin wisely the work of relief."

HOW TO MAKE AN UNPRODUCTIVE TREE BEAR.

THERE are many fruit-trees that seem to wear out the patience of their owners by failing to bear. They are apparently old enough, big enough, and have had everything in the way of cultivation and manuring done for them that seemed reasonable, and yet they will not bear.

It may be that excessively kind treatment has been the very cause of the refusal to bear. They have grown too much and are yet in the wood-making business rather than in fruit bearing. It may that the variety is not an early bearing one, and the proper time to bear has not come. The climate may be one which does not favour early bearing.

If either of the two latter is the cause a little more time may put things to rights. "However, the bearing of such trees may sometimes be hastened (says Mr. H. E. Van Deman, the American authority in *Texas Stockman*) by the same means that will be recommended for excessive wood growth; this is to check. There are several ways to do this. Some advise cutting back some of the roots, but I do not like this plan because it permanently cripples the tree. I have known iron spikes to be driven in the body. and sometimes the bark is pounded, which makes ugly scars. Neither of these methods seems advisable. The plan which I have followed with success and without permanent injury is girdling in early summer time. This should be done in June. A single cut may be made with a knife through the bark, entirely around the trunk at any convenient place; or, two or more such cuts may be made. If a ring of bark several inches wide is peeled off entirely around the trunk of an apple or pear tree at this time of the year, no harm will follow, for a new bark will soon form over the wound. Another very good plan is to remove long strips of bark about two inches wide, pointed at both ends, and leaving spaces of bark about the same width." The operation would be carried out in September, or early in October, in this Colony.

"Any of these will cause a checking of the flow of sap and an unusual formation of fruit buds instead of an excess of wood buds. The trees of the stone fruits are much more sensitive to injury and will not safely endure such treatment as has been described; nor do they usually need anything to force them into bearing."

THE PUMPKIN.

THERE is no better food for farm stock than the pumpkin, and the wonder is that it is not more extensively cultivated as a fodder plant. It is as good a stand-by as dairymen can have for their cows, for the pumpkins can be stored for a considerable time, and fed to the animals when the pasture becomes scanty or innutritious. The crop can be grown to great advantage in the same field as maize, and this practice is adopted with conspicuous success in the Lindenow district of Gippsland. The seeds also furnish excellent food for poultry, so that no part of the vegetable need be wasted. It is, in fact, better for stock to remove the seeds, as they may possibly prove dangerous to the cows, although this is unlikely. The pumpkin should be first broken open, and the inside parts, consisting of pulp and seeds, removed. The best way to utilise this part for fowls is to run the mass through a crusher, grinding the seeds into small pieces, so that they can be readily eaten by the poultry. The manner in which pumpkins are fed to stock determines to some extent their value as a fodder. Experience gained where they are largely used has shown that it is a mistake to feed them whole to the cows in the field. Cows actually break off or loosen their teeth in trying to break up pumpkins given to them in this manner. They should not be fed either whole or in large pieces, the best way being to chop them up with a sharp spade or an axe. If placed in a wooden tub, a few minutes' active work with a sharp spade will reduce them to small pieces, when they can be readily assimilated by stock without any danger of choking. In feeding pumpkins to cattle that have not acquired the taste for them, a gradual beginning should be made, and the ration steadily increased until the full diet is reached. One large pumpkin or two small ones per day for each animal is a liberal diet, and sufficient to keep the system in excellent condition. Where suitable land is available for their growth no more profitable farm crop can be raised, and the man who makes a mistake in connection with pumpkins is the man who does not grow them.—*The Australasian.*

ORANGES FOR EXPORT.

THE South Australian export trade in oranges may be regarded (says the *Adelaide Observer*) as almost past the experimental stage. The English market has been tested for the last three years, and growers have found that not only can the fruit be carried safely, but also that good prices can be realised if the oranges are landed at the right time. In opening new markets, however, success is attained very largely through initial failure. Nor must every orange-grower run away with the idea that because the London market has been thrown open to the result of his toil he can get rid by this means of any quantity and quality of oranges, and secure handsome profits. Fruit-growers who are thinking of wooing the British consumer cannot be too often and emphatically told that the first essential to success is quality, the second is quality, and the last is quality. Fortunately, the growers at present in the trade recognise this. They possess in a large measure that sort of genius which has been described as an infinite capacity for taking pains. The individual who expects to be able to pay all expenses incidental to shipping oranges 13,000 miles, and net a return much greater than the local market would give him, is doomed to disappointment. On an average of years, his credit balance may not be much larger than if he had not shipped; but he has the satisfaction of knowing that he assisted to foster a trade which, if non-existent, would leave him with a quantity of fruit on his hands at a time of the year when local demand was poor. Oranges begin to ripen from June, when the cold weather is against their consumption here. The longer the fruit is kept, the nearer it is brought into competition with the summer descriptions. When local demand is poorest, however, supply is shortest on the other side of the world; and the weather is such as to cause a juicy orange to be much sought after. In recognising these facts, the cultivator is making the best possible provision against a glutted market and its reaction in decreased production. An idea of the demand which exists in the United Kingdom for this description of fruit will be gathered from the following figures of total imports during the last seven years:—

1893	4,593,157	bushels	£1,368,957
1894	6,594,101	,,	£1,828,912
1895	7,698,739	,,	£2,111,090
1896	7,230,471	,,	£2,266,920
1897	8,797,203	,,	£1,925,415
1898	7,274,312	,,	£2,181,219
1899	8,550,494	,,	£1,986,960

"Though the trade has grown considerably since 1893, which was the first year when oranges were specified in the returns, Australia's contribution is as but a drop in the bucket. It might be thought that a few thousand cases from the "sunny south" would be lost sight of, if it were not borne in mind that at the time of the year when we are able to ship other supplies are very small. The following table of British imports of oranges shows the effect of Australian shipments (slight as yet, owing to the trade being in its infancy), and also the comparative bareness of the market from July to October:—

	1896. Bush.	1899. Bush.
January	1,005,228	1,244,269
February	1,177,562	1,272,685
March	1,156,547	1,357,443
April	796,161	1,023,171
May	497,115	933,233
June...	113,953	340,495
July	10,305	91,625
August	1,701	18,647
September	5,117	4,312
October	73,138	87,879
November	620,510	732,921
December	1,773,134	1,443,814
Total	7,230,471	8,550,494

"The trade from this Colony was opened in 1897, when several thousand cases were exported. In 1898, owing to short crop, the total was only about 500 cases, and in 1899, 1,600, cases.

"The increased production of citrus fruit in this Colony renders it necessary that steps should be taken to find fresh profitable outlets. The latest and complete Government statistics are for the year ended March, 1899, when there were 106,674 orange-trees in the Colony, yielding 47,420 cases of fruit, as compared with 104,612 trees and 46,469 cases in 1897–8; 99,098 trees, yielding 42,705 cases, in 1896–7; and 73,365 trees, yielding 43,817 cases, in 1895-6. The official statistics now being compiled will show a further increase in the number of trees and the production. Seeing that the statistics are collected early in the year, and that the fruit does not ripen till the third quarter, the output of the year 1899–1900 was disposed of in the exporting year 1899. The particulars, which will shortly be published by the Statistical Department, should, therefore, confirm the increase shown in 1899 exports. This is certainly the case with one division of the Colony, which is, however, the largest orange producer in the province. The county of Adelaide had in 1898-9 79,610 orange-trees, which yielded 24,530 cases; and in 1899-1900, 83,123 trees, producing 31,827. The number of trees has increased nearly 50 per cent. during the last four years, and the effect of this will be felt later. Inquiries are at present being made for suitable orange land by those who purpose growing for export.

"Oranges are raised most extensively around the foot of the Adelaide hills, where some of the best-kept orchards are to be found. A representative of this paper recently visited some of these in order to discover the prospects of the season. A call was first made upon Mr. Hobbs, of East Marden, one of the largest and most successful orange-growers in the Colony. Mr. Hobbs, who deserves all the success he has achieved, has added to his land within the last three or four years by purchasing a large adjoining estate. A walk through the well-kept grounds, where weeds have no chance, was proof that orange-growing has by the proprietor been reduced to a science. The trees—like those of other orchardists in the district—are free from disease, and are mostly heavily laden with fruit. The old orchard will not bear so prolifically this year as last; but altogether Mr. Hobbs, who has gone carefully into the export question, and several times visited London to see how the fruit turned out, expects to consign quite as many as last season. He is a strong believer in the oversea market, and so long as the trade at this end is in hands like his there will be no complaints of inferior fruit. Mr. Thomas James, a neighbour, is also among those progressive growers who see the necessity of establishing outside markets. He, too, has followed his fruit to London, and is so convinced that it will carry safely that he intends to ship this season in the ordinary hold. He has experimented with the cold chambers, the ordinary hold, and with cork-dust packing, in addition to the ordinary wrapping; and he has found that, if proper care is taken, there is no need to go to the extra expenditure involved in cold storage and cork-dust. His trees are bearing well, and will yield for export about the same quantity as last season.

"Hard by is the property of Mr. W. W. James. The trees here are younger, an addition having only recently been made to the orchard. Mr. James confirmed the opinions respecting the utility of the London market expressed by other orchardists, and added: "I shall be perfectly satisfied if I get my money back." Mr. Charles Pitt is increasing his last year's shipment, and Mr. Edward Tate, one of the largest growers of Salisbury, and Mr. F. Russell, of the same district, will help to supply the London markets. The mail liners are being more largely used this year than heretofore, and four of the Orient boats will carry oranges from Port Adelaide. The steamers of the Lund Line will also take their share, the "Yarrawonga" early this month opening the trade. Freight is 45s. per ton, which is a saving of exactly 45s. as compared with the cost of sending in cool chambers. The South African market will probably be tried, but former experiments in exploiting the Java market are scarcely to be repeated."

ORIGIN OF POLLED DURHAMS.

THE amount of misinformation concerning the origin of breeds abroad in the country is somewhat remarkable. It would appear that "the village sage," the wiseacre who dispenses store-box knowledge with liberal tongue to any audience he may assemble, reserves his weirdest work for the construction of theories concerning the origin of characteristic breeds. We have had personal acquaintance with these local oracles, and many a bit of "information" poured into our youthful ears from such sources had to be unlearned when fountains of true knowledge were later tapped. Probably more fiction has been coined anent the origin of the hornless breeds of cattle than concerning any other variety of live stock. The Polled Durhams have provoked much discussion and speculation. It matters not with what frequency the facts connected with the origin of this variety are stated, inquiries on this point are reiterated with the greatest regularity, generally coupled with the expression of a theory. The favourite theory seems to be that Polled Durhams sprang from a cross between the Shorthorn and Angus breeds. We have never been able to trace the source of this error, but it has been given currency in some parts of the agricultural press, and by that means crossed the water, where it has been gravely advocated by high authority as the true genesis of the hornless type.

Recently the inquiry again reaches this office, and the inquirer—a Missouri stockman—"claims Polled Durhams are a cross between Shorthorns and Angus." This claim has not the slightest foundation in fact. Polled Durhams were not originated or improved by Angus crosses. They were developed along two lines, one originating from a pure-bred hornless Shorthorn (called a "sport" in the technical terms in the laws of heredity), and the other line representing the use of pure-bred Shorthorn bulls, or native "muley" cows. Animals descended from the pure-bred hornless Shorthorn cow are called Double Standard Polled Durhams, because they are eligible to record in the American Shorthorn Herd Book, as well as in the Polled Durham Herd Book. The ideal animal to which breeders of Polled Durhams are working is a cow with all the characteristics of the Shorthorns except the horns. No blood other than Shorthorn and native "muley" has been used in building up this variety.—*Breeders' Gazette.*

Lessons from a Milk Record.

At all times and in all seasons we hear about the dairy cow and her management, how to get the most out of her by judicious feeding and careful handling; but what to my mind is of the most paramount importance is milking. What could be more annoying or distressing to the level-headed farmer than to know that often his well-cared-for cows are not clean milked? Undoubtedly the art of milking is fast dying out, and those interested will be glad to see that the British Dairy Farmers' Association have decided, for the first time, to give prizes for the encouragement of this art. It is as essential to have a good milker as it is to possess a cow which gives rich milk. The dairy farmer has to face the difficulty every year to get a number of competent hands. I have for years watched closely milking as it is done in this county (Cumberland), and I am convinced the loss is so great through slip-shod work that I dare not begin to estimate.

A good milker will get more milk and richer milk than one who does not put life into his work, and I do not think I am exaggerating when I say that uninterested manipulators who do justice to the cows are the exception rather than the rule. The majority of them, when placed down to a heavy milker, or one the least little bit "tough," do not take all the milk away, and it is here where the lazy work does mischief. Never keep a cow bad to milk is the advice of experienced farmers; get quit of her, because most milkers will not do her justice. When both weighing and testing I have tried to keep an eye on the average milker, and watch the result when a good manipulator follows an amateur the following milking. We have had occasionally the result of Continental experiments set before us touching upon this point. They are all unanimous in their findings that there is nothing beats rapidity of execution and thorough stripping. The following table is drawn up at random, taken from the record sheets, and the figures themselves are sufficient proof that good milking is an absolute necessity if successful and profitable dairying is to be carried on. The table gives the names of the cows, the first column of figures representing the percentage of fat in the milk when the work is done by a poor milker, and the second column the average percentage of fat in the milk for the whole year:—

Darky	2·5	3·5
Ada	2·4	3·2
Tosh	2·6	3·47
Ginger	2·7	3·4
Swing	2·2	3·11
Salmon	2·5	3·25
Spark	3·3	3·62

The next table shows the great contrast when the milk is tested the following milking after a poor milker has been at work. Sir Charles Cameron has shown us that butter-fat percentage figures can be as erratic if the period between milking is eight and sixteen hours respectively. The table gives the names of the cows, the first column of figures representing the percentage of butter fat with poor milker, and the second column the percentage of butter fat twelve hours after, when milked properly:—

Ellen	1·3	5
Darky	2·5	3·3
Ada	2·1	3·1
Ellen	1·6	3·9
Tosh	3·2	4·6
Ginger	2 5	4·3
Dainty	2·5	4

When we compare the first column of figures in the former table with the average per cent. of fat during the whole milking period, it shows a drop of 76 per cent. of fat through slipshod work. In the latter table we naturally have greater extremes. The averages tell us that a good milker following a moderate one gets 1·8 per cent. more butter-fat in the produce. In addition to the above it must be admitted that we occasionally come across a low percentage of fat for which we cannot account. The food may be the same, climatic conditions are to all appearances perfect, the cow is healthy, milking is done regularly and properly; but in spite of this an abnormal percentage of fat presents itself which cannot be accounted for. Cases such as these often crop up. This is one of the difficulties which baffle the most careful experimenters.—Robert Shanks, in *The Highland Society's Transactions*, Scot.

MAIZE CULTURE.

Some kinds of corn will do better than others on certain soils. I have been experimenting with seed corn for six years, and have a variety that I plant on thin soil that will outyield any corn I ever saw, while I plant a different variety on strong land. In selecting seed corn, I take my waggon and drive out to the field before there is any frost. Take a basket, go through the field and pick the medium-sized and well-developed ears from the best stalks. When I get 4 or 5 bushels I tie the ears together with twine and hang them up where they can dry out before a freeze comes. In this way I have never missed a good stand of corn.

Corn followed by oats, and oats or some other small grain by corn, is the proper way to raise a good corn crop, unless it should be to plant on sod. Where so many make a mistake is to plant the same field to corn three or four years in succession, and of course always plough the ground in the spring. Corn after corn is what wears out land. One year small grain and then one year corn will never wear out land, and if you will feed the land and keep it up. Stubble ground is clear of stalks and trash and can be tended much better and with less labour than stalk ground. Properly fitting the ground before planting is the most important part of corn-culture.

The harrow is my main tool in tending small corn. First, the ground should be perfectly level, so the planter will run at uniform depth and give an even stand of corn. I keep the harrow running from the breaking plough until the corn gets 4 inches high. Then I use the eagle-claw cultivator for the first and second ploughings, and for the third or last ploughing take off the eagle-claws and put on the gangs with the four big shovels. I like them better for laying by corn, as they cover everything up. Should ground be rolling, I prefer the little shovels, as the ground would not wash so badly. There is something in good seed corn and something in manure, but the main point in raising a corn crop is knowing how and sticking to it.—F. E. BRADLEY, Iowa, in *American Agriculturist*.

BREEDING HORSES FOR BONE.

WHENEVER breeding problems are under discussion, terms more or less difficult to comprehend are used. On the subject of "breeding for bone," a prominent English horse-breeder writes: "When considering a horse's points no practical man will begin to judge from the top. It is true that a horse with a taking head and general appearance is certain to attract anyone; but if upon the examination of his feet and legs it is seen that he has not sufficient bone to carry him, however good his other points are, he is useless, not only for carrying weight, but for standing much hard work of any sort. This principle applies to all classes of horses alike. The draught horse requires sound, strong 'under-pinning' to carry his massive body and successfully move heavy loads. The massive leg, however, is not always indicative of the strength of bone. We must learn to judge of bone by appearance and feel. Commonly we hear of 'flat bone' in a horse's leg; but there is no such thing in any breed; but 'flat' as applied to the appearance of the leg is correct and the desirable shape in all horses. The appearance of a round, meaty leg does not so much bespeak inherent lack of strength as it does undesirable attributes that generally accompany this type, such as grease, lymphangitis, and other diseases of the phlegmatic horse. Breed for the flat-appearing leg, for the reason that the bones of such horses are 'flinty' in quality, hard as gun-metal, and accompanied by well-developed, plainly-seen tendons, and in draught horses by a fringe of long silky hair springing from the back portion of the leg; whereas, in coarse-bred, sluggish horses the 'feather,' so-called, is likely to stick out all round the leg, and in quality is about as silky as the stuffing of an old-fashioned sofa. Choose the breeding horse that has big, sound joints and well-developed flat legs, that properly bear his weight. See that he shows the soles of his shoes plainly as he trots away, and it may be taken for granted that his temperament is desirable. The big, flabby, 'over-topped' horse is a poor type to breed. He has not the necessary quality and strength of bone to carry his body or stand hard work, and it is usual to find such an animal 'throwing out' splints, spavins, ringbones, sidebones, and curbs. Such blemishes constitute unsoundness, and seem to be Nature's way of branding a horse according to his character, as if to say the unsoundness seen is a sure evidence of an unseen source of unsoundness which is hereditary."

NEW USES FOR CORNSTALKS.

FIVE years ago the farmer considered the value of his corn crop practically concluded with the husking of the corn. What was left was worth perhaps 2s. 6d. an acre as fodder; rather under that figure than over it as a rule. Science, ever busily seeking uses for by-products, sought to make sugar and alcohol from the stalk of the corn, but unavailingly. Now, however, experiments along different lines have established the value of the by-products of the corn crop as probably second to no agricultural product of a similar nature grown in this country, and has almost if not quite doubled the receipts of the corn-growers, as the stalk is made practically as valuable as the grain. There is now a home market where the farmer can get from 12s. to £1 a ton for cornstalks; that is from £1 4s. to £2 10s. an acre for what has hitherto brought him in 2s. 6d. at best. The *American Agriculturist*, which treats of this new industry in a leading article, declares it to be one of the most important departures in industrial history. It gives the following list of what is made from cornstalks:—

1. Cellulose for packing cofferdams on battle-ships, thus preventing them from sinking when pierced by balls or shells.
2. Pyroxylin varnish, a liquid form of cellulose, the uses of which are practically unlimited.
3. Cellulose used for nitrating purposes for making smokeless powder and other high explosives, for both small and great arms, as well as purposes for which dynamite or all other explosives are required in various forms and degrees of strength.
4. Cellulose for packing, it being the most perfect non-conductor known against heat or electricity, jars, or blows.
5. Paper pulp and various forms of paper made therefrom, both alone and mixed with other grades of paper stock.

6. Stock food made from fine ground outer shells or shives of cornstalks, and also from the nodes or joints. The leaves and tassels also furnish a shredded or baled fodder.
7. Mixed feeds for stock, containing fine ground shells or shives as a base, and in addition thereto various nitrogenous meals and concentrated food substances, or blood, molasses, distillery and glucose refuse, sugar-beet pulp, apple pomace and other by-products.
8. Poultry foods of two types, namely:—Type 1, containing a dominant nitrogenous factor for laying hens; and No. 2, containing a dominant carbo-hydrate factor for fattening purposes.

The stalk of the maize-plant, or American corn, is made up as follows, on a basis of 100 lb. of air-dried stalks stripped of leaves and tassels:—Twenty-six pounds of nodes or joints, 20 lb. of pith, coarse and fine, and 54 lb. of shells or shives. The nodes contain, on an average, 33 per cent. of pure cellulose, the pith 36 per cent., and the shives 40 per cent. This corn-pith cellulose is of so great value in naval warfare that Lewis Nixon, the naval constructor, has declared it to be of as much importance as the development of Harveyised armour and smokeless powder. Cofferdams along the side of a vessel, when tightly packed with maize-pith to a thickness of 3 feet will not leak when perforated with shells or solid shot. When the cofferdam containing this material is perforated by a shot, the elasticity of the tightly-packed pith completely closes the hole made by the projectile, so that the water cannot pass through. Naturally some water must enter at the point of perforation, but owing to the great capacity of the pith to absorb water, it being able to hold more than twenty times its own weight when not pressed, the water that first enters is at once absorbed. This causes the pith which is moistened to swell, and thus close more completely the aperture made by the projectile.

The *Columbia*, *New York*, and *Olympia* are thus protected, and many of the new warships now under construction in the States, Russia, England, and France are using the new material instead of cocoanut fibre, which was formerly employed. In the manufacture of high explosives the corn-pith forms an excellent basis because of its admirable keeping qualities, and high-class smokeless powders and dynamites are now made from this product, which is said to be superior to cotton in that it is more easily nitrated and cleaned.

In the arts of peace the greatest value of the corn-pith at present is found in the liquid form of the cellulose, known as pyroxylin varnish, which is utilised in hundreds of ways. Nearly everything that is made from wood pulp can, it is said, be made from this material. Experiments are now under way looking to the manufacture of paper from cornstalk pulp. For one thing, it is predicted that a substance will be produced from the woody covering of the stalks which will produce a good quality of paper at such a price that it will be available for newspaper use. In the end it may be that the cornstalk will save the forests of this country which are being cut down for the consumption of the wood-pulp mill. The uses of the cornstalk for packing and food are varied, but too technical for discussion in a trade newspaper. As to the possibilities opened up by this new market, the *American Exporter* says:—

"The possibilities thus opened up are prodigious. To add only a few dollars per acre to each one of the 80,000,000 acres devoted to maize in the United States each year runs into a sum so fabulous as hardly to bear publication. But if it is assumed that only the fields of the corn belt will be benefited, those eight states, Kentucky, Ohio, Indiana, Illinois, Iowa, Missouri, Kansas, and Nebraska alone average close to 50,000,000 acres under corn. If only $5 per acre is added to the value of the crop in this belt, it means the tidy sum of $250,000,000 added to the farmers' income."

THE CULTIVATION OF GROWING MAIZE.

NEARLY every farmer is now alive to the advantages of frequently cultivating the soil between the maize rows. As in every other operation there is a right way and a wrong way of doing this, and although the work with the cheap and effective cultivators that are now procurable is not very heavy, and demands little skill, the good results are often diminished by want of regulation in regard to the depth at which the tines of the implement are allowed to run at different stages of the crop's growth.

We are indebted to the authorities of the North Dakota Experiment Station for the particulars of the following experiments conducted to determine at what depths cultivation should be carried out with least injury to the root system of maize-plants. For the experiment, and in order to obtain the illustrations now reproduced, the seeds were planted in frames sunk in the ground and enclosed with wire-netting, so that the soil could be eventually washed away, and the position of the roots left quite undisturbed:—

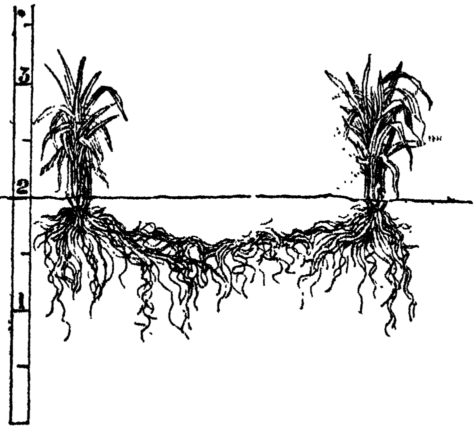


Fig. 1. Maize Roots thirty Days after Planting.

"Fig. 1 represents the growth of corn thirty days after planting. The hills were 3 feet apart, and each contained five stalks. The stalks extended 1¼ to 1½ inch beneath the ground. From the base of each stalk the roots radiated in whorls, there being four whorls, with three to six roots in each whorl, thus giving each plant fifteen to sixteen preliminary roots. When the corn was thirty days old the development of the roots seemed to be to the side of the hill rather than directly beneath the plant. The roots interlaced and attained a length of over 2 feet. Starting from the base of the root stalk, 1½ inch beneath the surface, these roots extended outward into the soil, making a slight angle downward. At 6 inches from the hill the main laterals were 2½ to 3 inches below the surface, while midway between the hills they were 4½ inches below the surface; some of the smaller roots considerably nearer the top. At this time a few roots had reached the depth of 12 inches, but the bulk of the root system lay within 8 inches of the top.

"In Fig. 2 the samples of corn are fifty-five days old and the hills are 3½ feet by 3 ft. 8 in. apart. The corn was hoed four times, but received no cultivation. At the time the sample was taken the corn

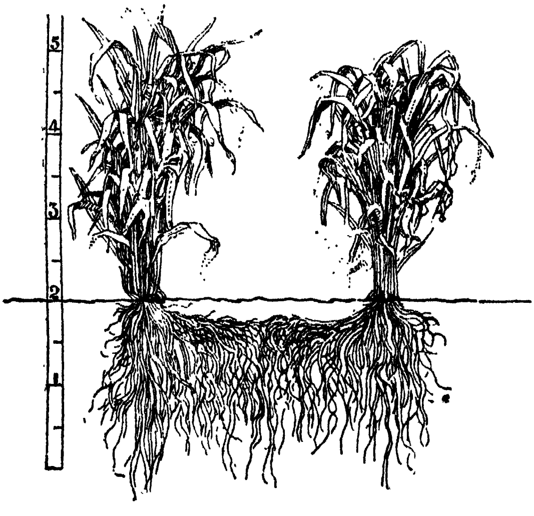


Fig. 2. Maize Roots fifty-five Days After Planting.

was 70 inches high to the tips of the leaves. The roots are much more numerous than in the sample thirty days old. The upper whorl resembles brace roots. The main roots are larger and stronger and have penetrated to a depth of 2½ ft. The number of horizontal roots have increased and extend from hill to hill, inclining slightly downward, but finally dipping abruptly. This latter tendency may be due to the drought. The corn, as will be noticed in the figure, has roots almost to the surface of the ground. There were many small feeders within 2 inches of the surface midway between the hills, but most come within 4½ inches of the top, but the feeders were within 2½ inches.

"The lesson is perfectly plain. At no time during the history of the corn crop should the cultivation be deep. If deep culture has to be practised at all, it should be when the corn is quite small and before many roots have developed. After the corn is two weeks old, cultivation should not be more than 3 inches deep. In many cases it would be preferable to have it only 2 inches."

The North Dakota Experiment Station has made extensive studies in the root system of other crops. They offer a wide field for investigation. Roots of crops planted in rows, such as corn, potatoes, beets, &c., grow near the surface, and those sown broadcast like wheat and the roots of the cultivated crops spread out horizontally, while those of wheat, grasses, &c., strike deeper. The adapting of a certain system of cultivation to the various crops is made possible by thoroughly studying the root system. Different modes of culture also tend to produce different kinds of root systems. The main point to be emphasized is thorough preparation of the soil before the crop is planted, and shallow and frequent culture after.

At the H.A. College, Mr. Valder has carried out similar tests in the field, and the results confirm in every detail the conclusions arrived at in the States in respect to regulation of the depth in stirring the soil in the maize drills.

KILLING WEEDS WITH CHEMICALS.

ACCORDING to a report which appears in the *Settler*, Professor Jones, of the Vermont Experiment Station, U.S.A., has devoted a considerable time to conducting experiments with the object of determining the efficacy of a number of chemicals for the destruction of weeds.

"Common salt was applied dry in amounts varying from 4 to 20 lb. per square rod, but it is so slow in its action that Professor Jones will not recommend it for weed-killing. Superintendents of public parks have used salt successfully in walks and roadways where weeds are troublesome. The value of salt as a weed-killer depends upon the fact that it draws water out of the plant tissues. It is, therefore, more effective when applied dry, on a hot, sunshiny day. Sulphate of copper has been recommended, but did not give satisfactory results. Plants apparently killed by it came to life later, and were as troublesome as ever. In Europe, weak solutions of sulphate of copper are used to destroy the weeds in grain. In North Dakota, also, such experiments have been made, but Professor Jones does not recommend it. Kerosene was applied, in the proportion of one part kerosene to three parts water, but 8 gallons of this mixture to the square rod failed to kill the weeds. Crude carbolic acid destroyed the weeds where one gill or more of the acid was used to a gallon of water at the rate of 8 gallons per square rod. In twelve hours after this was applied, all the parts of the weeds above ground were brown and dead. These plants included plantain, dandelion, chicory, ragweed, and grasses. The dandelion roots were not entirely killed, and some new shoots appeared two months later. Quack grass and Kentucky Blue grass also threw up some new shoots, but the other plants were mostly killed. The trouble with carbolic acid is that it does not penetrate deeply enough into the soil to kill the underground parts of certain weeds. Its odour is against it; this is strong and disagreeable.

Another objection is that the acid does not dissolve well in water. The mixture must be constantly stirred in order to keep it in uniform.

"White arsenic was used in combination with washing soda, 7 lb. arsenic to 2 lb. of soda, and from 3 to 9 gallons of water. The weaker mixture killed practically every weed. The perennial grasses were the only plants that survived, and most of them were killed. It did not kill so quickly as the carbolic acid, but its injury was permanent. Two objections to the use of arsenic are the trouble of preparing it and its dangerous character. Arsenite of soda is a form of arsenic readily soluble in water. This was used at the rate of 1 lb. to 4 gallons or 8 gallons of water. The latter strength destroyed all weeds, and its action was a little quicker than the other mixture of arsenic. Two commercial weed-killers were used at the rate of 8 gallons to the square rod. They destroy the weed quickly and effectively, and were on the whole better than the carbolic acid, though no better than the arsenic solution. Chemical analysis showed that these commercial herbicides contained arsenic not unlike the home mixture here named. Professor Jones concludes that such places as gravel walks, drives, and tennis courts can be kept free from weeds by the use of the arsenic solution. One or, at most, two applications each season will keep down the weeds. Salt in the dry form can be used for this purpose, but it is not so sure nor so prompt as the arsenic solution."

Mr. Geo. Valder, Principal of the Hawkesbury College, strongly recommends the application of a one in four solution of arsenite of soda for the destruction of rank weeds and grasses. The arsenite of soda can be obtained at 30s. a cwt., or from 3d. to 4d. a lb.; 1 lb. is dissolved in 4 gallons of water and is sprayed or sprinkled over the plants to be destroyed. Care must be taken not to use an excessive quantity—a few experiments will soon enable one to determine the killing dose (see note in *Agricultural Gazette,* page 527, June, 1900).

PEANUTS.

A COUPLE of months ago a correspondent at Wetherill Park, near Liverpool, reported having grown a very fine crop of peanuts, and asked for advice as to the best means of utilising them.

In addition to the information already supplied as to the general utility of this easily-grown and prolific "nut," the following details from the New York *Evening Post* may be of interest, as showing the importance of the crop in the States and Europe:—

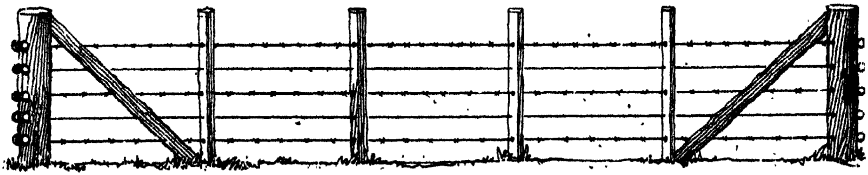
"It appears that the peanut crop of 1899 is nearly 1,000,000 bushels heavier than the crop of the preceding year. The total crop will, it is thought, reach nearly 4,500,000 bushels of 22 lb. each. The bulk of the crop is produced in Tennessee, Virginia, and North Carolina. It is not generally known that the American yield constitutes but a small proportion of the peanut crop of the world; the exportation from Africa and India to Europe is nearly 400,000,000 lb. annually, half of which goes to Marseilles to be made into oil. The running variety is a typical American peanut. Its vines are large, with spreading branches growing flat on the ground; the pods are large and white. There are many more varieties grown, some of them being upright bushes instead of vines. The so-called Spanish nuts are used principally by confectioners. They have small, round kernels, and are very fine; the crop averages annually 150,000 bags of 110 lb. each. It is only within the last few years that peanuts have been shelled by machinery. With the increase of their production machines have been taking the place of the old, slow-going methods.

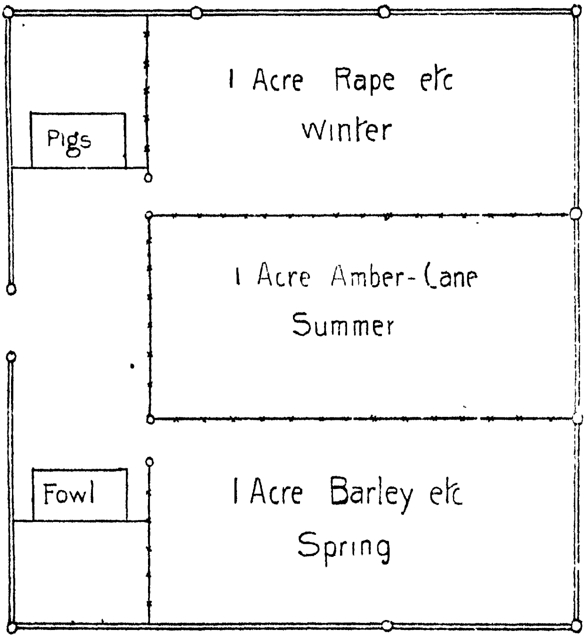
"To grow peanuts successfully requires a calcareous soil without too much lime, and under such conditions the yield runs from 30 to 40 bushels per acre. There are about twenty peanut factories in America, and the capital required for starting a mill is small. One factory handles 5 tons of peanuts daily, producing 235 gallons of refined oil, 175 gallons of crude oil, 3,680 lb. of flour and meal, and 3,300 lb. of stock food. An extensive grower does not take the trouble to separate peanuts from the vines and dirt when he has dug his crop, but sends everything to the factory. They are put into the mill—vines, dirt and all—and are then placed into a hopper and fed into a revolving cylinder, which cleans them by friction, the dirt, leaves, and vines being taken out by a suction pipe. The nuts remain in the cylinder, and they are fed out upon a revolving slat-table, the slats resting upon canvas, from which negro women pick out those of the first grade, which are known as "fancy." The selected nuts are fed from the table into chutes and then into bags. The remainder are run over a second revolving slat-table, fed into chutes, and packed into bags labelled 'extras.' Four grades are sorted, the first three being sold to dealers and the fourth to confectioners for making burnt almonds and cheap candies. America does a heavy export business to Europe in peanuts. Foreigners do not eat them as Americans do, but grind them into meal. They also make oil of them, which is resold to Americans as olive oil. The nuts are very rich in oil, 40 per cent. of the shelled nut being oil. After the oil is extracted, the cake which remains is sold for £6 a ton in Germany, and fed to cattle and sheep. Peanut butter is one of the latest uses of the peanut. It is made by grinding the nuts very fine and reducing the mass to a pasty substance, a portion at least of the oil being removed. Salt is added as flavouring."

PIG FENCES.

OWING to some delay in obtaining illustrations of some of the types of fences that have proved most suitable for pig farms, the article on the subject has been held over.

Since writing, Mr. E. A. Grant, of Welcome Orchard, Parkesborough, has been good enough to submit, for the information of readers of the *Gazette*, a plan of his cultivation paddocks and pig and fowl runs with a diagram of his fence. Mr. Grant says:—"About twelve months ago you gave a description of the pig-yards at the Hawkesbury College. Thinking they may be beyond the means of many small farmers, I take the liberty of sending you a plan of my pig and poultry yards combined; and in addition, the best way of utilising and straining barbed wire. The above shows disposition of wires, one plain (No. 8) and one barb alternately, 5 inches apart. The holes for the barb wires are bored with 1¼ in. augurs. A strain in length of plain wire is inserted through these holes; the barbed wire is fastened to one end of the plain wire and a horse at the other, and the barbed wire is pulled through with neither injury nor difficulty. At the strainers I unravel the first set of barbs and knot on 3 feet of No. 8, and use Walker's strainers, which are cheap and effective and only necessary at alternate strains. The outside fences, in addition to the barbed wire, is netted with 3 feet wire-netting, which is sufficient to keep in Orpingtons and Langshans. The inside fences only require *two barbed wires.* I replace the top one with No. 8. This effectively checks the pigs, and the fowls have access to the whole of the ground."





Replies to Correspondents.

Feeding and Management of Pigs for Bacon-curing.

"CYCLOPS" asks: "1. Whether a small pen or large paddock is best for pig-raising for bacon purposes. 2. Whether pigs should be kept active up to the last month or two, or fattened up from the start. 3. Do pigs pay the extra cost of feed, say, after eight or nine months. 4. What kind and style of feed is best calculated to get a pig into proper condition, *i.e.*, moderately fat." Most of these questions are answered in the articles now appearing on pig farming and bacon-curing; but as some readers may prefer their information in the form of direct question and answer, the following replies by Mr. Geo. Valder, Principal, Hawkesbury Agricultural College, are reproduced:—

1. In raising pigs for bacon purposes it is best to run the pigs from weaning till ready for "topping up," on either pasture or crops. Should they not appear to grow fast enough the addition of a small quantity of grain, ground and mixed with hot water, or, better still, with milk, or boiled whole, and fed once a day, will greatly assist.

2. They should be allowed to have a moderate amount of exercise until they are brought in for "topping up."

3. No; baconers should be ready for putting on the market at from seven to nine months. They rarely pay to keep after this age.

4. Grazed on pasture or crops, they should be ready for "topping up" at about seven months. And provided they had had a fairly even supply of food, a months "topping up" on barley, peas, or maize, should be quite sufficient. Grazed on pasture or crops, and given a grain ration once a day in the paddock for the last two or three months, often in a good season they would be ready for the curer without being put in fattening pens.

Poisoning Crows.

IN reply to a correspondent who asks for advice on the subject, Mr. W. Farrer reports:—In regard to poisoning crows, I am sorry to say that the results of the experiments I made some two or three years ago were not entirely satisfactory. The difficulty of killing these birds by poison—at any rate, by quickly-acting irritant poisons—arises from the fact that they are able to eject from their crops anything that they wish not to retain; and this is naturally the case when they find they have swallowed a bait which has on it any of the irritant poisons we are in the habit of making use of. This, indeed, I have actually observed to happen; for a crow which had taken a bait I had poisoned with strychnine was seen to eject it from his mouth after he had shown that he had begun to feel the effects of the poison, and afterwards to recover. I next tried injecting a strong solution of strychnine into the yolk of an egg, by means of a hypodermic syringe through a hole in the shell made with a pin. Eggs poisoned in this manner were put out on several occasions, a dozen or more at a time, after nightfall with the word "poisoned" written on them. These baits were invariably taken early in the morning, but the number of crows about the place did not seem to diminish, although on one occasion several freshly-dead ones were seen the day after baits had been put out, under some ring-barked trees about a mile distant which these birds were in the habit of frequenting. Although eggs were rather too valuable in the house to use in large numbers for baits, I should probably have persevered with this method of poisoning if I had only had the satisfaction of seeing results in the shape of dead birds; for I think that an egg forms a much better bait than a piece of meat, for the reason that it probably cannot be expelled from the crop so readily or so completely. Another method of using strychnine for crows has been recommended to me by two persons residing in widely-distant parts of the Colony. This method is to mix the poison with fat, which is then made up into pellets, which are placed on fresh hides or sheep-skins. This method is probably effectual, because the fat has begun to melt in the crop before discomfort from the poison is felt, and the melted fat is difficult to get rid of altogether. A method of using meat for baits, which I am told is successful, is to prepare it by beating it into a pulp before the poison is placed in it. This method I have never tried, and I think it less likely to be successful than pellets of fat. Phosphorus on pieces of meat is successfully used, I am assured, by a squatter on the Bogan; there is some risk, however, attached to the use of this substance, and I should only have recourse to it if my trials with other poisons were to fail. For some cunning old fellows which have been frequenting my place for a long time, and taking a tithe of my eggs which would satisfy the most exacting of parsons, I am proposing to make a trial of a slower-acting and less disagreeable poison than strychnine, and more insidious, in the shape of acetate of lead. This substance is not likely to give rise to unpleasant symptoms at once, but remains in the system, and only kills after it has accumulated in it. In using this substance for crows I shall rub it into pieces of meat and lay them out as baits in the usual manner. For sparrows, which are now becoming an intolerable nuisance, I am proposing to mix it and a little flour with wheat cracked rather finely. The matter of the action of the different poisons on birds, so far as I know, has never yet been examined into. It might be made, with advantage, the subject of a series of experiments.

Some Dairy Farming Questions.

"A New Chum Selector" asks:—

1. What is the difference between "factory" and "creamery" butter, and why does the latter always command the higher price?

2. If a separator is used in a private dairy, in what respect would the butter produced differ from ordinary "factory" butter. That is

to say, does the difference between "dairy" and "factory" butter lie in the appliances used, or in the method of using them?

3. Is it practicable for dairymen on a small scale to adopt the methods necessary to produce a uniform quality of butter equal to average factory butter?

4. What is the cause of the "fishy" odour and taste frequently noticeable in apparently good factory butter? Is it due to a micro-organism, or to a taint derived from other articles packed in close contiguity? If due to a microbe, why does this "fishy" taint seem peculiar to "factory" butter only?

5. Are "Shorthorn" and "Durham" synonymous terms for the same breed of cattle, or is "Shorthorn" a generic term for several allied breeds, or a name for one distinct breed?

The Dairy Expert, Mr. O'Callaghan, replies:—

1. *Dairy* butter is made in a home dairy where a separator is not used. Factory butter is the name given in Australia to butter which is made from separated cream, but without the aid of a refrigerator. In the British Isles factory butter is the term applied to butter which has been bought from farmers (generally when it is freshly made), and sent to a central factory, where it is graded and worked like creamery butter. It is put up in packages to resemble creamery butter. Creamery butter is the term applied (in Australia) to butter which has been made from separated cream in a factory where refrigerating appliances are used for cooling the cream. Thus, if a man who owns a hand separator, or runs a separating station, supplies his cream to a central factory where there is a refrigerator, the butter made therefrom is called creamery butter.

2. If a separator is used in a private dairy, and the butter made in that dairy, it would be termed *factory* butter, because our private dairies do not possess refrigerating machines.

3. Dairymen working on a small scale can make butter equally as good as a creamery, provided they go to the expense of erecting a refrigerating machine and proper cold chambers, but the weakness here is the unwarranted expense, besides the fact that even though uniformly good butter is made, the quantity would be small, and hence the general uniformity of New South Wales butter would suffer.

4. Fishy butter is the term applied to butter which has a somewhat fishy odour and taste. Butter which is tallowy is sometimes confounded with "fishy" by those who are not accustomed to the true fishy flavour. In my opinion the disease called "fishiness" is due to the action of micro-organisms. It is a very old complaint, and had been known in dairy butters for years before the separator was invented. It is generally noticed first when the butter is six or seven weeks old.

5. Shorthorn and Durham are simply different names applied to the same breed of cattle. The more modern name is Shorthorn.

Preparation of Oatmeal.

"A NEW CHUM SELECTOR" asks:—What processes are oats subjected to in manufacturing the oatmeal used for human consumption? The points I specially desire information upon are—(*a*) Are the oats baked or kiln-dried before grinding? (*b*) Are they ground by the old-fashioned millstones used for wheat, or by the roller-milling process? (*c*) How is the outer husk removed? (*d*) What is the percentage of waste in the whole process? (*e*) Is any other special treatment required to perfect the meal, or to make it keep a reasonable time? (*f*) Can a person without much expense manufacture good meal for home use? I may add that I grow my own oats of good quality, and possess a small hand-mill, in which I grind coffee, and have also ground rice and wheat, but do not know how to remove the oaten husks.

In answer to these questions the Chemist, Mr. F. B. Guthrie, says:—(*a*) In order to remove the husks, the oats have to be kiln-baked before grinding. (*b* and *c*) The husks are removed by means of shelling-stones, which are special stones which could be made by any millwright. The husks are then separated by a wind-fan or bellows. After the husks are removed the grain can be ground to meal in any sort of mill, but special shelling-stones are required for husking. (*d*) There should be little or no waste if the whole is ground to meal, except loss in grinding. (*e*) None that I know of. (*f*) The only expense is the shelling-stones. The mill you mention would answer quite well for grinding.

Poison Trails for Noxious Animals.

MR. A. G. WITTS, of Wywye, Yarrangobilly, writes:—In *Gazette* for September *in re* poisoning foxes, a number of trials are mentioned. I have never trailed for foxes, but have done a lot of baiting and trailing for dingoes. The trail I have always found to give best results is the haunch taken from a slaughtered sheep with contents emptied. It is light to drag (generally tie to horse's tail), tough, and, to my mind, leaves a better trail than anything else.

AGRICULTURAL SOCIETIES' SHOWS, 1900.

Society.	Secretary.	Date.
Dapto A. and H. Society	A. B. Chippindall	Jan., 10, 11
Thornleigh and District Horticultural Association	Fred. N. Brack	,, 13
Albion Park A. and H. Association	H. Fryer	,, 17, 18
Kiama Agricultural Association	James Somerville	,, 25, 26
Gosford A. and H. Association	W. McIntyre	,, 26, 27
Wollongong Agricultural Association	J. A. Beatson	,, 31, Feb., 1, 2
Agricultural and Horticultural Society, Shoalhaven	R. Leeming	,, 8, 9
Manning River (Taree) A. and H. Association	W. Plummer	,, 9, 10
Alstonville Agricultural Society	N. R. Elvery	,, 14, 15
Moruya A. and P. Society	John Jeffery	,, 14, 15
Lithgow Agricul., Horticul., and Produce Society	M. Asher	,, 15, 16
Ulladulla A. and H. Association	C. A. Cork	,, 21, 22
Tumut Agricultural and Pastoral Association	M. McNamara	,, 21, 22
Central Richmond River Agricultural Society	D. Cameron	,, 22, 23
Cobargo A., P., and H. Society	T. Kennelly	Mar. 1, 2
Robertson Agricultural Society	R. E. Ferguson	,, 1, 2
Berrigan A. and H. Society	R. Drummond	,, 7
Canowindra P., A., and H. Association	A. E. Smith	,, 7
Tenterfield I. P., A., and M. Society, Show	T. W. Hoskin	,, 6, 7, 8
,, ,, Fair days	,,	,, 9, 10
Candelo A. Association	C. H. Brooks	,, 7, 8
Campbelltown A., H., and I. Society	A. R. Payten	,, 7, 8
Walcha Pastoral and Agricultural Association	F. Townshend	,, 8, 9
Oberon A., H., and P. Association	Alf. Gale	,, 8, 9
PortMacquarie and Hastings District A. and H. Society	J. Y. Butler	,, 8, 9
Berrima District A., H., and I. Society (Moss Vale)	James Yeo	,, 8, 9, 10
Campbelltown A., H., and I. Society	A. R. Payten	,, 9, 10
Lismore A. and I. Society	T. W. Hewitt	,, 7, 8
Cudal A. and P. Society	C. Schramme	,, 14
Bega A., P., and H. Society	J. Underhill	,, 14, 15
Central New England (Glen Innes) P. and A. Assoc.	John Priest	,, 14, 15, 16
Nepean District A., H., and I. Society	E. K. Waldron	,, 14, 15, 16
Macleay (Kempsey) A., H., and I. Association	E. Weeks	,, 14, 15, 16
Goulburn A., P., and H. Society	J. J. Roberts	,, 15, 16
Cumnock P., A., and H. Association	W. L. Ross	,, 20, 21
Bombala Exhibition Society	R. H. Cook	,, 20, 21
Armidale and New England P., A., and H. Association	W. H. Allingham	,, 20, 21, 22
Mudgee Agricultural Society	J. M. Cox	,, 21, 22, 23
Inverell A. and P. Society	J. McGregor	,, 21, 22, 23
Camden A., H., and I. Society	C. A. Thompson	,, 21, 22, 23
Crookwell P. and A. Association	J. W. P. Levy	,, 22, 23
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28, 29
Clarence P. and A. Society (Grafton)	J. C. Wilcox	,, 28, 29
Blayney A. and P. Association	H. Woolley	,, 28, 29
Gundagai P., A., H., and I. Society	A. Elworthy	,, 29, 30
Lower Clarence (Maclean) Agricultural Society	Geo. Davis	April 3, 4
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 4, 5
Cooma P. and A. Association	C. J. Walmsley	,, 4, 5
Upper Hunter (Muswellbrook) P. and A. Association	J. C. Luscombe	*
Orange A. and P. Association	W. Tanner, junr.	April 4, 5, 6
Warialda P. and A. Association	W. B. Geddes	,, 4, 5
Royal Agricultural Society of New South Wales (Sydney)	F. Webster	,, 11-21
Rylstone H. and A. Society	W. Taylor	,, 25, 26
Bathurst A., H., and P. Association	W. G. Thompson	,, 25, 26, 27
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	,, 25, 26, 27
Wellington P. and A. Society	James Thompson	May 2, 3
Moree P. and A. Society	S. L. Cohen	,, 2, 3, 4
Upper Manning A. and H. Association, Wingham	Wm. Dimond	,, 3, 4
Durham (Dungog) A. and H. Association	C. E. Grant	,, 9, 10
Richmond River A., H., and P. Society (Casino)	Jas. T. Tandy	,, 10, 11
Hawkesbury District A. Association (Richmond)	C. S. Guest	,, 10, 11, 12
Gunnedah P., A., and H. Association	J. H. King	May 15, 16, 17
Nyngan A. and P. Society	J. C. Cahill	,, 16, 17
Coonamble P. and A. Association	F. C. Lamotte	,, 23, 24

Society	Secretary	Date
Deniliquin P. and A. Society	H. J. Wooldridge	July 19, 20†
Wentworth P. A., and I. Society	J. W. Thorn	,, 18
Riverina P. and A. Association (Jerilderie)	Wm. Elliott	,, 24, 25
Hay P. and A. Society	G. S. Camden	,, 25, 26
Condobolin P and A. Association	D. H. Tasker	,, 25, 26
Balranald P. and A. Society	— Murray	Aug. 1
Forbes P. A. and H. Association	N. A. Read	,, 1, 2
Parkes P. and A. Association	G. W. Seaborn	,, 8, 9
Lachlan Pastoral and Agricultural Association (Hillston)	Thos. Cadell	,, 10
Corowa P. A. and H. Society	E. L. Archer	,, 14, 15
Gunnedah P. A., and H. Association	J. H. King	,, 21, 22
Cootamundra A., P., H., and I. Association	Thos. Williams	,, 28, 29, 30
Northern Agricultural Association, Singleton	Ch. Poppenhagen	,, 29, 30, 31
Murrumbidgee P. and A. Association (Wagga Wagga)	R. E. Shorter	Sept. 5, 6
Grenfell P., A., and H. Association	Geo. Cousins	,, 5, 6
Manildra P. and A. Association	G. W. Griffith	,, 5
Albury and Border P., A., and H. Society	Geo. E. Mackay	,, 12, 13
Burrangong P. and A. Association (Young)	Geo. Ward	,, 12, 13
Yass P. and A. Association	F. C. Mackintosh	,, 13, 14
Moama A. and P. Association	C. L. Blair	,, 19
Cowra P., A., and H. Association	H. Smith	,, 19, 20
Junee P., A., and I. Association	G. W. Scrivener	,, 19, 20
Burrowa P., A., and H. Association	Fred. H. Trout	,, 21, 22
Millthorpe Agricultural Association	S. C. Francis	,, 25, 26§
Temora P., A., H., and I. Association	W. H. Tubman	,, 26, 27
Germanton P. A. and H. Society	G. T. S. Wilson	,, 26, 27
Namoi P., A., and H. Association (Narrabri)	J. Riddle	Oct. 10, 11
Tweed, Brunswick, and Border P. and A. Society (Murwillumbah)	R. Campbell	Nov. 28, 29

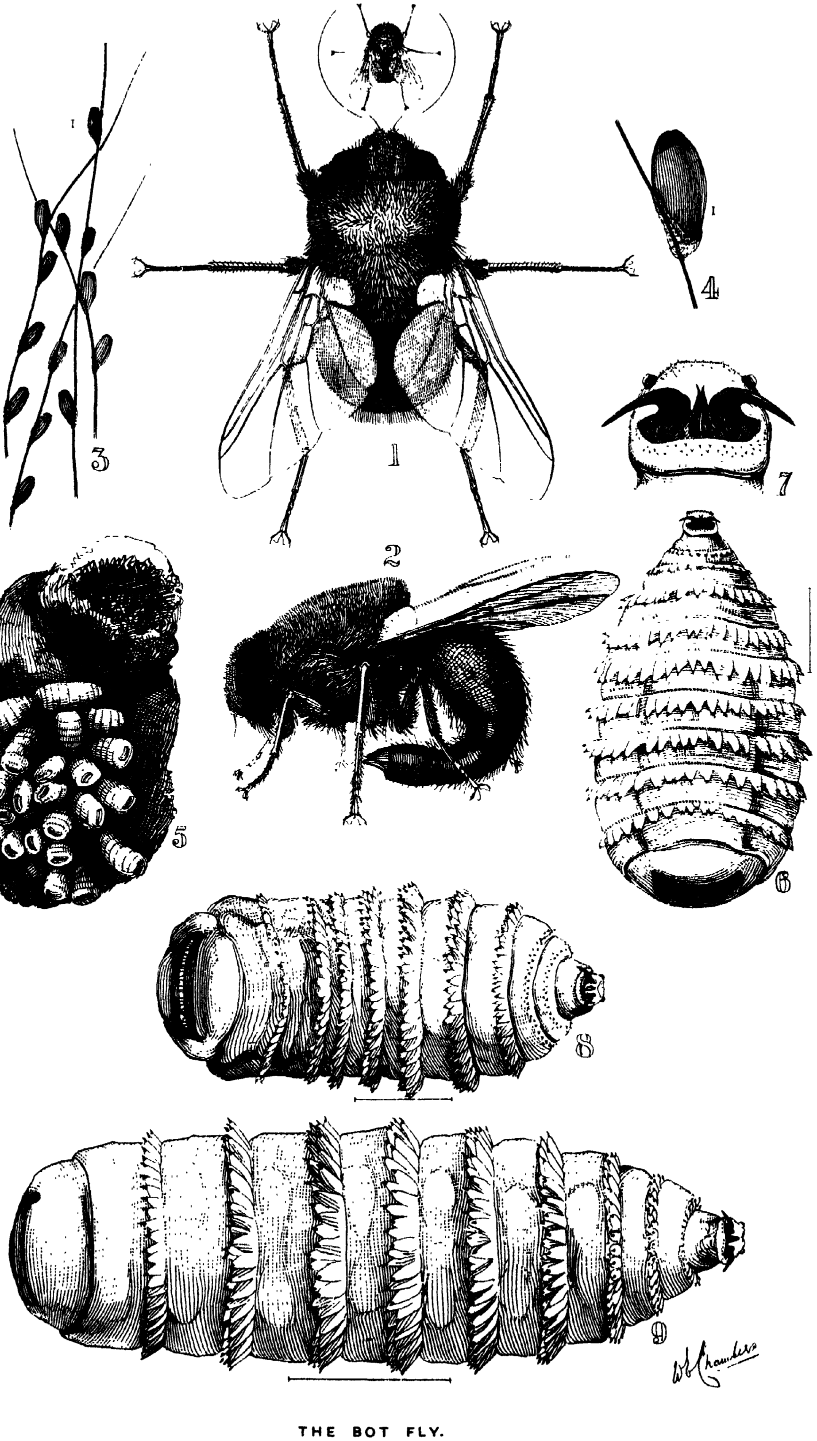
1901.

Society	Secretary	Date
Dapto A. and H. Society	A. B. Chippindall	Jan. 9, 10
Berry Agricultural Society	A. J. Colley	,, 22, 23, 24
Wollongong A. and I. Association	J. A. Beatson	Jan. 31, Feb. 1, 2
Kiama A. Association	Jas. Somerville	,, 26, 28
Shoalhaven A. and H. Society	R. Leeming	Feb. 13, 14
Central Richmond River Agricultural Society (Coraki)	D. Cameron	,, 13, 14
Shoalhaven A. and H. Society	R. Leeming	,, 13, 14
Manning River A. and H. Association	S. Whitbread	,, 44, 15
Alstonville Agricultural Society	Henry R. Elvery	,, 26, 27
Armidale and New England P., A., and H. Association	W. H. Allingham	Feb. 27, 28, Mar. 1
Tumut Agricultural and Pastoral Association	Bland Clayton	,, 27, 28
Robertson A. and H. Society	R. Ferguson	Feb. 28, Mar. 1
Tenterfield Intercolonial, P., A., and M. Society	F. W. Hoskin	Mar. 5, 6, 7‡
Bega A. P. and H. Society	John Underhill	,, 6, 7
Berrima District A., H., and I Society (Moss Vale)	Jas. Yeo.	,, 7, 8, 9
Lismore A. and I. Society	T. M. Hewitt	,, 12, 13
Central New England (Glen Innes) P. and A. Assoc.	Geo. A. Priest	,, 12, 13, 14
Crookwell P. and A. Association	M. P. Levy	,, 21, 22
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Inverell P. and A. Association	T. P. Borthwick	,, 20, 21, 22
Warialda P. and A. Society	W. B. Geddes	,, 27, 28
Mudgee Agricultural Society	Joseph M. Cox	,, 20, 21, 22
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 27, 28
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28
Upper Hunter P. and A. Association (Muswellbrook)	J. C. Luscombe	,, 27, 28, 29
Royal Agricultural Society (Sydney)	F. Webster	April 3, 10‖
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	,, 17, 18, 19
Namoi P. A. and H. Association (Narrabri)	J. Riddle	,, 24, 25
Orange A. and P. Association	W. Tanner, jun.	,, 25, 26
Durham A. and H. Association (Dungog)	Chas. E. Grant	May 2, 3

* Show postponed till 1901. † Sheep Dog Trial, 23 May. ‡ Fair Days, March 8, 9.
§ Show and Intercolonial Champion Ploughing. ‖ Entries close 6 March, 1901

[16 plates.]

Sydney: William Applegate Gullick, Government Printer.—1900.



THE BOT FLY.

The Bot-fly.

(*Gasterophilus equi.*)

BY WALTER W. FROGGATT,
Government Entomologist.

As several notices have recently appeared in the newspapers stating that the "Bot-flies" are causing the death of horses in the southern districts of New South Wales, it is advisable for everyone to be on the look-out for them, for the season is rapidly approaching when, if there are any of these pests in the neighbourhood, they will emerge from the dormant pupæ buried in the soil and deposit their eggs upon horses.

I therefore propose in these notes to give some account of these flies, their habits and life-history, so that farmers and others interested in stock can recognise both the larval "bots" and mature flies when they come across them.

There is no record of bot-flies having been found in the northern districts of this Colony, and the chief area of infestation is around Wagga, Bombala, on to the Victorian border; but, at the same time, I have seen portions of the stomach of a horse killed at Botany that were thickly covered with the bots, so that it is probable that bots are much more common than is generally suspected.

The bot-flies belong to the family *Œstridæ*, which contains a number of rather large flies with very short antennæ and the front of the head standing out. They are distinguished from all other flies by having the mouth parts obsolete or aborted, and only represented by two or three fleshy tubercles (except in several of the minor genera) and they all have stout wings with few veins. These flies lay their eggs or larvæ upon the hairs or skin of different animals, from which position they work their way through the skin, or gain an entrance into the mouth (by means of the animal licking itself), and make their way into the internal organs. Westwood grouped the *Œstridæ* under three heads—*cutaneous*, the warble flies; *cervical*, those attacking the nasal cavities; and *gastric*, those found in the stomach. Those whose larvæ live beneath the skin are generally known as "warbles," as the "ox warble" (*Hypoderma lineata*). In this case the eggs are licked off the hairs of the animal they infest, and thus carried into the mouth; but instead of making for the stomach, they work their way through the tissue to a point immediately beneath the skin, where they remain stationary, forming a warble or lump from which the fly makes its escape through the skin, leaving behind an ulcerated fester. The eggs of some species that attack the smaller and softer-skinned animals simply hatch where they are deposited, and the minute larvæ pierce the skin, forming the warble beneath.

The sheep-fly (*Œstrus ovis*) lays its eggs in the nostrils of the unfortunate sheep, from whence the larvæ make their way through the mucus of the nasal passages. The sheep when badly infested develop a disease known as "staggers," which sometimes kills numbers.

Many animals appear to be infested with their own particular species; there are about ten species known in England which infest the horse, ox, ass, sheep, and red deer. The camel in Arabia is infested with a large species (*Cephalomyia maculata*), and as Mr. Tepper has recorded the finding of some large bot-larvæ in South Australia, said to have come from the camels, it is probable that it has been introduced into those districts of Australia where camels are used for carrying. Even the smallest animal has its parasite, for at a meeting of the Entomological Society in 1888, Mr. C. O. Waterhouse exhibited the larvæ of an *Œstrus* which measured nearly an inch and a half in length, and was found in the body of a common mouse from Peru, of which it occupied almost the whole of one side.

The true bot-flies belong to the genus *Gasterophilus*, and the common species is known as the horse-bot (*Gasterophilus equi*); it was recorded in Victoria a good many years ago. There may be several species in Australia. Kirk,[*] writing of the pest in New Zealand, says: "There seems little doubt that we have at least two, if not three, species of horse-bot in this Colony; but that common in the North Island is, undoubtedly, *Gasterophilus equi*, a comparison of New Zealand specimens with types received from England revealing no difference whatever." This species has a very wide range over Europe and North America, and was introduced into New Zealand many years ago, and was also recorded from Victoria some time before it was observed in this Colony.

Naturally, it is very easy for these flies to be introduced into a clean country in the larval state while infesting imported animals; and though I understand that the droppings of all stock in quarantine are burnt, some may be voided after the animals have finished the regular time of detention. I have recently had samples of bots from Fiji, said to have been introduced with mules from America, which is a different species to the common one in Australia.

Though there is no doubt about the damage that the warble-flies of the cattle and the nasal-flies of the sheep do to the animals they infest, there is a great diversity of opinion as to the effects of bot-flies in the internal organs of the horse; some authors even assert that their presence does not hurt the animal at all, but rather has a beneficial effect. Bracey Clark, who published a treatise on these flies in 1796,[†] was of this opinion, and also the well known naturalist, Réaumur. Vallisnieri, however, attributed to this cause an epidemic which killed an immense number of horses in Italy in 1713, as many of the horses dissected were found to have their stomachs full of these larvæ. At the present time, most authorities agree that a horse infested with bot-flies in any quantity (and as many as 400 have been taken out of the stomach of a horse), will lose flesh and waste away. Yet it is very rarely that a horse dies from bots; but where a horse has some other organic disease, the two combined may cause its death, and the bots being found covering the walls of the stomach, are credited with being the sole cause of its death. There can be no question that the local irritation caused by these larvæ, each attached to the membrane by a double hook at the tip of its head, must be very great, though entire perforation of the stomach is very rare.

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[*] "Leaflets for Farmers," No. 19, 1895. T. W. Kirk, Department Agriculture, New Zealand.

[†] Trans. Linnean Society, Vol. III, 1796.

Life History.—The eggs are dull light brown to dirty white in colour, elongate oval in form, somewhat pointed, and broadest at the apex. The fly deposits them singly upon the hairs, the shell being coated with a sticky substance that glues them on, so that it is a difficult matter to pull them off. I have had hair taken off an infested horse with hundreds of them, but never saw one hatch out in the jars in which they were kept. These eggs are generally deposited on the jaw, shoulders, or flanks of the animal, from whence, through the animal licking itself, they are conveyed to the lips and mouth, the warmth dissolving the gluey secretion and hatching the enclosed maggot, thus enabling it to crawl out into the throat, from which it gains access to the stomach, and takes up the position which it retains, attached to the coating of the stomach until it is fully developed, when it loosens its hold and is carried through the intestines and voided with the dung; but very soon afterwards it works its way downwards and buries itself in the soil, where it pupates, and from which the perfect fly emerges in about six weeks in the summer time; but the final development is retarded or accelerated by the time of the year in which they are cast out.

The larvæ vary from dull yellow to light reddish-brown, and are of a general oval form, measuring up to ¾ of an inch in length and 5 lines in diameter in the centre. The head portion is attenuated and armed with two stout hooks placed back to back, each curving outward, with the mouth between them, and, when in position, these hooks and the mouth are buried in the membrane of the stomach, causing a pit or scar to form, which shows quite distinctly when the bot is detached. The segments of the larvæ are very well defined, and each is ringed with a band of regular, short, fleshy spines, tipped with a black point, which, together with the cephalic hooks, are very distinctive characteristics of the bot, by which it can be easily recognised.

The fly is about half an inch in length, the male having the abdomen broad and rounded at the tip, but that of the female is slender and elongated, and is generally carried curled down beneath the base of the body. The head is dark yellow, thickly clothed with short golden-yellow down; the thorax clothed with fine pale yellow to light brown hairs or down, which gives it the appearance of a hairy bee. The abdominal hairs are lighter along the sides, and intermixed with shorter black ones on the dorsal surface. When flying about it makes a loud humming noise—a sound which the horses seem to recognise instinctively, for as soon as they hear it they gallop about and show decided signs of fear; yet, as the fly has no mouth, it cannot be caused by the dread of its bite.

Remedies.—There are numbers of different drenches that have been suggested and recommended by stock-owners to destroy or purge out the infesting bots; but when once the horse is infested internally, it is more a matter for the chemist and the veterinary surgeon to deal with than the entomologist; but again, quoting from Kirk's paper, he gives Mr. H. Thompson's, M.R.C.V.S., remarks as follows:—"I know of no medicine that will destroy them or make them leave their winter quarters until fully developed. As a medicine, 2 oz. of turpentine and 20 oz. of raw linseed-oil, mixed and given as a draught once a fortnight, is the best remedy, *i.e.*, if it is thought the loss of flesh of the horse is due to bots."

Prevention is better than cure, and in any district where the presence of bot-flies is suspected, a watch should be kept during the early summer, and the horses regularly examined to see if they are egg-infested. The eggs can be easily noticed on the hairs of the jaws, legs, and shoulders. They can be removed by grooming, and the horse rubbed with carbolised oil, or washed with carbolic soap, or other oily substances that will not hurt the skin, but are distasteful to the flies, and will deter them from depositing their eggs upon such evil-smelling coats. These flies are said to dislike dark places, and will not enter stables or sheds; so that where only one or two horses are kept, if remaining under cover during the time when the flies are about, they would be safe from their attacks.

Bots in Mules.

Mr. Thomas Steel, F.C.S., F.L.S., of the Colonial Sugar Refining Company's Nausori Mill, Rewa River, Fiji, has kindly furnished me with the following report of investigations he has carried out with the view of determining the best means of treating mules infested by bots:—"One mule was selected and isolated for experiment. On evening of 2nd September a bran mash was given. Next morning at 7 a.m., 1½ drachm of carbon bisulphide was given in a pint of water, and the dose repeated three hours later; then at 6 p.m. 1½ pint of linseed oil. The excreta was examined for a period of forty-eight hours. That for the first twenty-four hours, being dry and formed, was spread, in small quantities at a time, on a sheet of tin, and thoroughly and carefully searched; while that for the latter twenty-four hours, being soft and semi-liquid, was mashed in a double-bottomed sieve and treated as before.

"The results were, for the first period, two thread worms; and for the second, hundreds of the same parasite, a few hair worms, and two pin worms, but not the slightest trace of bots.

"The physiological action of the drug on the animal was not marked, the only point noticed was a slight acceleration of pulse. The animal, is now at grass, seemingly well."

Note on Preceding Report.

Simultaneously with the receipt of above report from Nausori Mill, we have one from another of our Fiji mills reporting that the bot flies had commenced attacking the horses. As the bots are supposed to remain for something like a year inside the animals, and the flies emerge in about a couple of weeks after the voiding of the bots, it is highly probable that these flies are from recently-voided bots, and that in Fiji, just at the time of trying the carbon bisulphide treatment, all the bots may have naturally left the mules; hence the negative result at Nausori Mill, as far as bots are concerned. The expulsion of so many parasitic worms would lead us to expect a similar effect on bots when present, and instructions have been given to repeat the carbon bisulphide treatment from time to time during the ensuing year.—T.S.

Conclusion.

Since these notes were written I have examined some specimens of bot-flies in the National Museum collections in Melbourne, which Mr. Kershaw tells me is the common species in Victoria. These flies are named *Gasterophilus salutaris*, and are identical with specimens I have received from Wagga; and only a few days ago Mr. Steel received specimens from the Colonial Sugar Company's estates in Fiji, which also belong to this species. The bots of all these flies also agree in having a double row of spines round the segments, while the larvæ of *Gasterophilus equi* are described as having a single row. Some bots taken from a New Zealand racehorse, killed at Botany, New South Wales, had only the single row, and probably belonged to the latter species. Walker describes four species as found in England, and this one as rare. It differs from the common species in having unclouded wings, and the more brilliant tints upon the head and thorax.

Walker gives the following description :

Gasterophilus salutaris, Œstr., pl. 1, f. 35, 36 (1815) : Long. 4½-5 ; wings, 9-10 lines. Body black, very pubescent, shining, punctured, brighter and more robust in the male than in the female ; head clothed with short ochraceous hair ; eyes dull, castaneous ; thorax covered with orange down, having at the base of each wing an orange spot, which is more distinct in the male than in the female ; wings slightly brown, yellowish-brown at the base and along the fore border ; coastal vein brown, the others paler ; alulae, opaque-white ; abdomen black in the middle, clothed with pale-yellow hairs towards the base, and with orange hairs at the tip ; legs reddish-brown, clothed with paler down. Not common.

REFERENCE TO PLATE.

1. Dorsal view of Bot-fly. *Gasterophilus salutaris*, Clk.
2. Side view ,, ,, ,, ,,
3. Eggs of Bot-fly on hair of horse.
4. ,, (enlarged) ,, ,,
5. Larvæ or Bots attached to stomach of horse.
6. Bots of *Gasterophilus salutaris* (mules), Fiji.
7. Head segment of Bot of *G. salutaris* (horses), Sydney.
8. Bots of *Gasterophilus salutaris* (horses), Sydney.
9. Bot of *Gasterophilus equi* (New Zealand racehorse killed in Sydney)

Geese.

J. J. McCUE.

History.

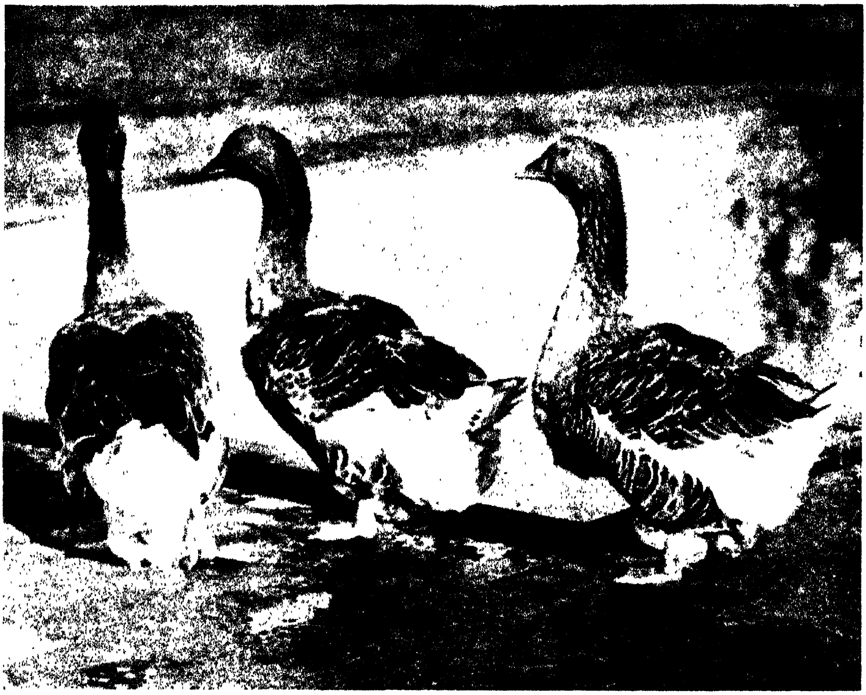
GEESE were known among the ancients hundreds of years before the Christian era. We read how the sacred geese, kept by the Romans, 400 B.C., saved the city from the Gauls; also, how they were thrown overboard at another time because they displeased the Roman sea-generals. Pliny speaks of them "being cultivated for their flesh and feathers"; and Darwin says "hardly another anciently domesticated bird or quadruped has varied so little."

The goose tribe number some forty species, and belong to the family *Anatidæ* of modern ornithologists. The majority of species are larger than ducks, and smaller than swans.

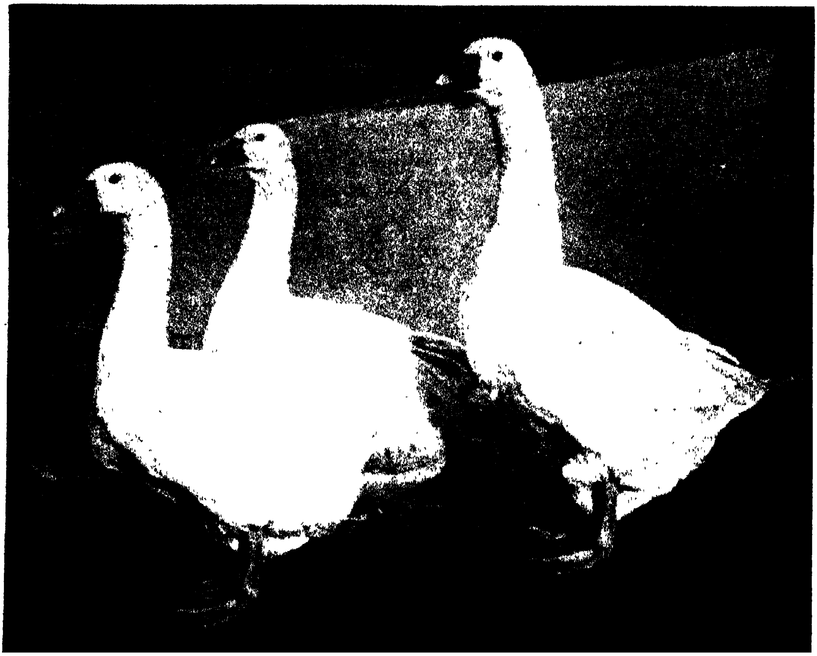
The true species of geese belong to the genus *Anser*, and number about twenty varieties. One of these—the Greylag goose, *Anser ferus*, the origin of most of our domesticated breeds, is a bird of very wide range, being found in most European countries from Lapland in the north to Spain and Bulgaria in the south, and throughout Asia to China, but does not seem to have been found in Japan. It is the indigenous bird of the British Islands, and in former times bred freely in the fen and marshy counties, where the young were caught in large numbers and domesticated with the tame flocks. The wild goose generally laid from six to seven eggs, the nest being made in reeds or heather. Under domestication the Greylag goose has increased in egg-production and size, while the plumage has become lighter in colour, being more or less marked with white.

I cannot find any authentic record of when geese were first introduced into Australia; it is not clear when they were first domesticated in England. America had her first Embdens landed in Boston in 1821 by Colonel Samuel Jaques. Mr. Edward Brown says in his "Geese and Geese-breeding": "Unlike the domestic fowl and the turkey, neither of which is indigenous to Europe—the former coming from Asia and the latter from America—the goose in its wild form is a denizen of Europe and North Africa, and this fact doubtless explains much in relation to it. Although we have no statistics which can be relied on to tell us how many geese were kept a hundred years ago, it may be safely concluded that the number was greater in Britain than at the present time. The last reliable tables giving the numbers of geese in Great Britain were taken in 1885, and were as follows:—

	Geese.			per cent.
England	615,724			
Wales	234,146	In grazing counties	427,460	69·4
Scotland	35,440	In corn counties ...	188,264	30·6 "
Ireland	2,133,609			



No. 1.—TRIO OF TOULOUSE GEESE AT H. A. COLLEGE.



Varieties of Geese.

The varieties best known in the Colonies are: Toulouse, Embden, and African or Cape geese. The other classed varieties that are best known are: The Egyptian, Canadian, Chinese, Danubian, and Russian. There are several other varieties, but the above are considered the most profitable under domestication.

Toulouse.

This variety take their name, rightly or wrongly, from the city of Toulouse in Southern France, where they are reared in large numbers. They are the largest of domestic geese, and frequently attain a great weight, pairs of ganders being weighed at English shows that tipped the scales at 50½ lb. Their general appearance is a square, massive-looking body, thick head and neck, the throat showing a fold of pendant skin—known as the "dewlap," the body carried fairly horizontal, the folds of skin between and behind the legs nearly touching the ground. The shoulders should be broad; neck medium in length and moderately thick; the head and bill strong and presenting a fairly uniform curve over the top to the bill, which is orange-coloured, with a flesh-coloured nail at the end of it. The feathers of the neck are curled or twisted from the head towards the shoulders. The back, wings, and thighs are of a dark, even, steel-grey colour, each of the feathers being laced with a much lighter shade, nearly a pure white. The flight feathers are free from this lacing. The breast and under parts are a clear grey, running into a lighter shade near the thighs, until white at the abdomen and under the tail. The stern and paunch should be pure white, not mixed with grey as seen in some specimens. The tail also is white, and across its centre there should be a broad band of grey. There seems to be contrary opinions among some geese-breeders as to the proper colour of eye. The eye should be brown or hazel, the rim usually the colour of the beak. The legs are rather short, stout, of a deep reddish-orange colour, and placed well apart. The gander and goose are exactly alike in colour and feathering, and it is often difficult to distinguish the sexes. Standard weights are: A two-year-old gander, 28 to 30 lb.; young gander, about one year old, 18 to 22 lb.; two-year-old goose, 20 to 22 lb.; and one-year-old goose, 18 lb.

In breeding the Toulouse variety, size is very important. We should have the breeders as large as possible, and as near correct type, colour, &c., as we can get them. The Toulouse is a very fleshy variety, and, given a large frame, will carry a large amount of meat, though some say it is a little coarser than the flesh of other varieties. It is not a quick grower, compared with other varieties; still it is not very far behind the quickest growers of the other geese. There are very, very few pure-bred Toulouse geese in the Colony; those seen at our best shows being anything but good type, size, or colour. The birds shown in illustration No. 1 are winners at the premier shows in England, and a pair (gander and goose) weighed, when taken out of the ship's coop, 50¾ lb., and were not at all in prime condition; neither were they in full feather when they *stood* to have their photos.

taken, yet a good idea can be arrived at as to their type, size, &c. It is very difficult to get a good likeness of any kind of birds by photography, but the artist in this case (Mr. Grosse) has, by the exercise of great patience and ingenuity, achieved success.

As layers, the Toulouse can be classed as good, the goose often laying from forty to fifty eggs in a season. They are not good as sitters; in fact, some geese do not sit at all.

Embden.

The Embden or Bremen geese originated in Holland, and when first introduced into the United States of America from Bremen were given that name after the city of Bremen. All authorities agree that this variety gained its name from the town of Embden in Hanover; at any rate, it is known by that name wherever the variety is kept.

The true type of Embden differs in appearance, apart from colour, from that of the Toulouse. The neck is longer and finer, the head leaner and longer, and the dewlap is wanting. The shape of the body is not so deep in front, or carried so low between the legs, hence appears taller and slighter than the Toulouse. The back is broad, the body compact, more tight-feathered than the Toulouse, which makes the bird look smaller than its loose-feathered cousin. It has the same curled or twilled appearance of the neck feathers, but the abdominal pouch is but slightly developed as compared with the Toulouse, consequently the bird appears taller and higher from the ground. The neck and head should be of medium size, not too large or too fine. The eye is bright blue, and the rim the colour of the bill. The plumage is a pure white, without any coloured feathers whatever, the only change being in legs, bill, and feet, which should be bright orange. The nail at the end of bill is nearly white, and so are the toenails.

The Embdens scale heavier than they look on account of being tight-feathered, and attain nearly the same weights as the Toulouse. As layers they do not lay as many eggs as the Toulouse, but they lay earlier, and their eggs are slightly heavier. They are model sitters and mothers, the goose being very careful with her brood, and one that protects them with great spirit.

In breeding Embdens care should be taken to have the geese as large as possible; the geese of this variety being smaller than the gander. The goslings of this variety are generally hardy, grow rapidly, which is an important point in their favour. At the time a Toulouse gosling is in a lanky condition an Embden of the same age would be plump and fleshy; and when killed and dressed their nice white colour makes them more attractive than the coloured varieties. Illustration No. 2 will give a good idea of what true Embdens are like; a pair of the birds shown in illustrations weighed, when taken out of ship's coop, 48¾ lb.

African or Cape.

It seems a very difficult task to trace the original home of this variety. It has been known under so many names—Guinea goose, Spanish goose, &c., and its home given in five or six different countries

—that 'tis a puzzle to know which is correct. Mr. J. K. Felch, a prominent poultry-breeder and judge in America, says: "The African goose, I believe, has been credited to Africa—the region near Zanzibar. It is a goose as heavy as the Embden or Toulouse; has a shorter, thicker neck, and darker grey colour than the Brown China; knob and bill are black, with a prominent dewlap, and a voice harsher and heavier than all others. My own belief is that it is a species indigenous to Africa. We cannot say that it is like the Brown Chinas or the domestic goose of India, all of which have longer and more swan-like necks, while the African weighs all of 6 lb. more than the Chinas. I think that they were imported to this country before the White and Brown Chinas were received."

In my opinion, the African and Chinese geese came from the same stock, the Chinese being the original; selection and climatic influences have given us the African. I favour the Chinese with being the original stock, because of their smaller size, habits of flying, and other little ways that remind us of the wild goose.

The African geese have a more erect appearance than either the Toulouse or Embden; the body is large and long, well developed about the shoulders and breast; the neck fairly long, of fair size and nicely curved, the head rather large, bill stout and not too long, and a knob at the base of the upper mandible. This variety should have a heavy dewlap or pendant fold of skin under the throat. The bill and knob are of a black colour, and the eyes hazel or brown; the colour of the back, wings, and tail is dark grey, shading to a lighter grey on the breast and under parts of the body. A dark-brown stripe extends from the head down to the back of the neck; the legs and feet are dark-orange colour, with toenails black. The weights are: For adult gander, 20 to 22 lb.; young gander, 16 to 18 lb.; goose, 18 lb.; and young goose, 14 to 16 lb. This variety lays a very large egg, and sometimes more than the Toulouse or Embden varieties. The goslings put on flesh quickly, and are ready for market early; there is one drawback to them being a nice market carcase—and that is the dark pin-feathers, which gives the body a dark appearance.

Chinese.

This variety is known by many names. Mr. Whittaker, of Somerset, England, says: "It has names enough to fill a menagerie—China goose, Knob goose, Hong Kong goose, Asiatic goose, Chinese swan (*Cygnus sinensis*, Cuvier), Guinea goose, Spanish goose, Polish goose, Anas and Anser Cygnoides, Muscovy goose, and probably more besides."

The variety known in the Colonies as Cape geese are closely allied to the Brown Chinas of America; in fact, are more Chinese than African. There are two varieties of Chinese—the White and the Brown—both of which are smaller than the Toulouse, Embden, or African. The White China's body should be round and full, the neck long and nicely arched. In walking the carriage is very upright, the neck and head carried well forward, giving the bird a tall and bold appearance. The head is fairly large, bill rather long but slim, excepting at the base of the upper mandible, which should have a large knob. The colour of knob and bill should be orange, the bill having a white nail. The eyes are bright blue, with orange rim. The plumage is a pure spotless white, the legs and feet orange, with white toe-nails.

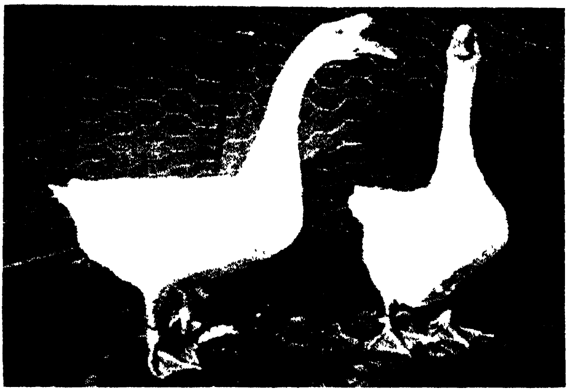
The Brown China is the same in size, weight, and shape as the White. The colour of the plumage is nearly the same as the African, except where the African is grey the Brown China should be brown. The head and stripe down the back of the neck should be dark brown, wings and tail brown, other plumage greyish-brown shading, lighter on the under parts of the body. Legs and feet dark, with a greenish or orange tinge, and toenails black. The eyes should be bright, large, and brown or hazel in colour. The weight of a good adult Brown China gander should be at least 15 lb.; adult goose, 13 lb. to 14 lb.; young gander, 12 lb.; and young goose, 10 lb. The China geese are not bred extensively for market purposes, geese-raisers preferring the Toulouse, Embden, or African; they consider the Chinese too small. Yet, when a small-boned and medium-sized carcase is wanted, this breed "fills the bill." As layers they are good, very hardy, and grow quickly if on a good run, or cared for properly.

Egyptian.

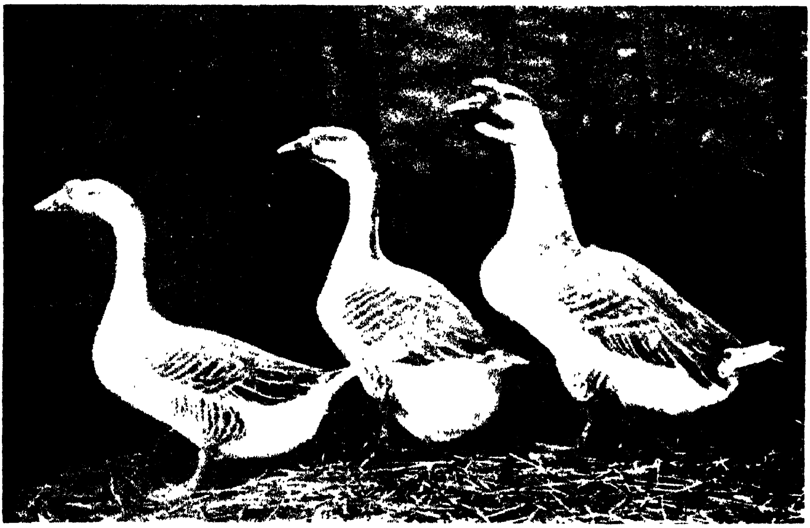
For a description of the Egyptian, Danubian, and Russian I am indebted to Mr. Edward Brown's "Geese and Geese breeding." According to Mr. Brown, "It has sometimes been contended that this variety should not be included among the races of geese intended for practical purposes, but should be classed with ornamental breeds, and there is a measure of truth in this statement. But for a reason which will be obvious later on, I have decided to include it, more especially as its value for crossing purposes has yet to be determined.

"The Egyptian is a small goose, usually measuring from 27 to 28 inches in length, and having a bill slightly over 2 inches long. In the male the head and neck are hoary, the occiput a rusty colour, as also the stripe round the eye and down the neck. There is a castaneous ring around the lower part of the neck; the upper back, scapulars, tertiaries, and a patch on the back castaneous, some of the feathers being intermixed or sprinkled with black, and the inner webs of some of the tertiaries grey.

"The whole of the remainder of the breast and the under surface is a light iron-yellow, sprinkled with brown, except the abdomen, which is pure white; the vent is an iron-red, the lower part of the tail and the spurious wings black, the second wings metallic green, and the shoulder and wing coverts white, the greater ones having a bar of black across the tips. The eyes and legs are orange. Some specimens have orange-coloured bills, and others a reddish-purple. The bar of the wing is unusually narrow and rich in lustre, and the pencilling or marking on the flanks, thighs, and breast most beautiful. The Egyptian goose is different in formation from other varieties, is somewhat erect in carriage, yet short-necked; it is Asiatic in the appearance of the head, the tail sloping down from the back, the whole body long for the size of the bird, and the legs somewhat short. In the female, which is



No. 3 PAIR WHITE CHINESE GEESE.



No. 4.—TRIO OF BROWN CHINESE GEESE.

slightly smaller than the male, the chestnut patches round the eyes and on the breast are smaller."

From all accounts the Egyptian breeds very well in confinement, is a good layer of a fair-sized egg. Those who have tasted the flesh of this breed say that it is "gamey," and would be improved if the variety was crossed with some other of our domesticated varieties. The gander, when fully matured, weighs 10 lb.; young gander, 8 lb., goose, 8 lb.; and young goose, 6 lb.

Canadian.

The Canadian, or Canada goose, is a wild species of North America. Since its domestication it has increased greatly in weight and other differences from the true wild variety. No doubt food and care has done much to increase the size in the domesticated bird, but there are rumours that the size was increased by crossing.

For a description of this variety I am indebted to the "Birds of America," vol. vi. The American naturalist, Audubon, says: "Head, small, oblong; bill, shorter than the head; neck, long and slender; body, full, slightly depressed; feet, short, stout, placed behind the centre of the body; legs, bare a little above the joint; wings, of moderate length, with an obtuse protuberance at the flexure; plumage, close, rather short, compact above, blended on the neck and lower parts of the body. The feathers of the head and neck very narrow; of the back, very broad and abrupt; of the breast and body, broadly-rounded; wings, when closed, extend to about an inch from the end of the tail; tail, very short and rounded; bill, feet, and claws black; iris (eye), chestnut-brown; head and two upper thirds of the neck glossy black; forehead, cheeks, and chin tinged with brown; lower eyelid, white; a broad band of the same across the throat to behind the eyes; rump and tail feathers also black. The general colour of the upper parts is greyish-brown, the wing coverts shaded into ash-grey; all the feathers terminally edged with very pale brown, the lower part of the neck passing into greyish-white, which is the general colour of the lower parts, with the exception of the abdomen, which is pure white, the sides, which are pale brownish-grey, the feathers tipped with white, and the lower wing coverts, which are also pale brownish-grey. The margins of the rump and the upper tail coverts pure white. Female similar in colouring, although the tints are duller; the white of the throat is tinged with brown; the lower parts are always more grey, and the black of the head, neck, rump, and tail is shaded with brown.

"In size the wild birds are as follows:—Gander, 7 lb.; goose, 5¾ lb. On the other hand, the domestic Canadians are given as: Adult gander, 16 lb.; adult goose, 14 lb.; young gander, 12 lb.; young goose, 10 lb. This variety of goose is a moderate layer, but is specially characterised by the quality of its flesh, which is spoken of as exceptionally fine in texture and flavour. The Canadian geese are very hardy and quick growers, but, as already indicated, there has been a large infusion of the blood of the wild into that of the ordinary goose; their chief value is for crossing, and as a means of giving fresh vigour to the ordinary races."

"*Danubian.*

"The breed to which the term Danubian is applied is sometimes called the Sebastopol goose, and appears to be found more or less over a wide area in South-eastern Europe. Probably the latter term may be explained by the fact that geese of this variety were brought over to England about the time of the Crimean War by ships returning from the Black Sea. A few specimens have been met with in this country (England), but many are shown at the Continental exhibitions.

"The special characteristic of this breed of geese is that the hind quarters of the bird are covered with loose, shaggy feathers, some of which are long enough to touch the ground. These feathers are sometimes quite or nearly straight, but often have a curl in them, which gives them an increased value in the feather trade. As a rule, the plumage is pure white, and when that is the case is regarded as more correct; but I have seen specimens in which grey or light-brown patches were to be found. The head and neck are similar to those of the Embden, but they are not so high in front, and give the appearance of a very compact body. Of course, the loose feathers look untidy, and under certain conditions must become very draggled; but upon water this breed appears attractive.

"These geese are moderate layers, but are very good sitters and mothers; and the fact of their not having the disposition to roam to the same extent as some varieties is a point in their favour, where space is limited or where they would be likely to do harm. They are gentle in temperament, live contentedly with other fowls, and at the same time obtain a large amount of their own support, so that they can be maintained inexpensively. The quality of the flesh is not regarded as being equal to that from our best Western breeds; but upon this point there is a want of direct or reliable evidence. The weight of the adult male is about 10 lb.

"*Russian.*

"During a visit paid to Russia (1899) I came across a breed of geese of which I have never heard before, and which possesses characteristics peculiar to itself. Of these there are two varieties—namely, the Arsamas and the Tula, the former being the more numerous at the St. Petersburgh Exhibition, and also the larger in size of body. These geese appear to be bred chiefly in the country to the south of Moscow, of which the manufacturing town of Tula is the centre. They are stated to have been bred in Russia for centuries, with the object of using them for fighting, and the structure of head and body is calculated to enable them to do battle effectively. The laws of the country prohibit this sport; but it is evident that even in Russia laws are not always obeyed, and a good deal of this fighting is surreptitiously carried on. I was unable to secure much information as to this race of geese as I should have wished, at any rate as to their origin, and it is probable that there is very little direct history obtainable.

"These birds are by no means pleasing in appearance, and have a bull-dog type of head which attracts attention, and indicates the use to which they have been put. In the first place the head is very short, and nearly round, with a wide forehead and well-developed cheek muscles. In the older specimens two knobs appear on top of the skull, with a depression between. The bill or beak is very short, and stout at the base, so that the head and beak are together about the same length as the head is deep. The head, in fact, is more like that of a parrot, if the curled tip of beak is omitted, than of a goose, the line drawn from the top of the head to the tip of the beak being nearly straight. From the nostrils the surface of the bill is ribbed, and the colour is pale yellow with a tip of ivory. The eye is large and full, in some cases nearly black, and in others grey or light blue, with eyelids parchment colour. The neck is short for a goose, strong, and slightly curved. The back is wide, flat and straight, the breast wide, full and round, and the body large and stout. The wings are large, with very strongly developed shoulder muscles. The legs are of medium length, strong, wide apart, and the feet large and round; the plumage is close and compact. The Arsamas variety is pure white in plumage, and the weights from 15 to 20 lb., whilst the Trila variety is grey in colour, and sometimes clay, the weight in this case being 12 to 15 lb.

"As already mentioned, this variety has been bred chiefly for its fighting instincts, and it is stated that the ganders are as keen for battle as a true fighting game cock. Here we have the same results as are seen in our English game fowls, namely, that in seeking to develop strength of muscle and of limb, unconsciously the flesh properties were greatly improved. It is well known that no fowl carries so much flesh upon the breast as the game, in relation to the weight of body, due to the fact that with increase of size in wings there must be a correlative increase in breast muscle, the latter being the motor for the former. It is claimed that this is equally true with regard to the fighting geese of Russia, and from the appearance and depth of body we should be willing to accept this statement. It is found in Russia that the best results are obtained by crossing the Arsamas gander with another breed of geese, such as the Toulouse or Embden, the softer flesh of these latter counteracting that hardness which must result from breeding for fighting purposes. These fighting geese are only moderate layers, which can be expected when we consider what they are chiefly bred for."

Australian Geese.

We have two distinct varieties of geese belonging to Australia; the pied, or half-webbed goose, and the small cereopsis goose. Both varieties, especially the latter, were at one time fairly plentiful in this colony, but are now only to be found in the quiet, sparsely-populated districts.

The Black and White Goose.

The pied variety, the larger of the two, have the front toes only webbed at the base, and the hind one is long and not raised above their level, and furnished with a large claw. The lores are naked.

The metatarsus is reticulate and longer than the third toe. This bird is about the size of the Brent goose, and has a dull black and white plumage, a hooked beak, with a large warty, comb-like prominence on the front of the head; the claws are long and sharp, and the whole foot is adapted for perching on limbs of trees, &c.

Cereopsis Goose.

This goose, *Cereopsis novæ-hollandiæ*, is best known to us as the "wood duck," "tree duck," and "grey duck," many being under the impression that it is a true duck and not a goose. This is a more terrestial type of goose than any now existing, and its osteological characters point to a relationship with a New Zealand goose (*Cnemiornis calcitrans*), of large size, that could not fly, and is now extinct. It has a short decurved bill and greenish cere; the plumage of the female is a grey colour, with rounded black spots; the male has a blackish neck and back. This variety may be kept in parks or gardens, and will thrive in captivity, but I have never heard of them being domesticated so that they would breed.

Breeding Geese.

Unlike fowls and ducks, geese breeding is in very few hands, and the majority who do keep them do not give them the proper care and management for best returns. One of the principal faults with most geese-breeders is that they run the geese without any idea or rules for their proper management. The geese are on the farm or homestead; they often receive no care, no food—only what they can pick up—and when grass is scarce, they are compelled to live "by chance" till the grass grows again. They are allowed to interbreed—in fact, do as they please—be good layers or bad; and if the goose does happen to rear a few goslings, well and good, the owner will use or sell them. Geese, if looked after properly—not mongrels—will pay a profit as well as any other bird on the farm; but if neglected they will not pay for their food.

To those who wish to keep geese, I would urge the necessity of having only good thoroughbred stock, and a good laying strain of whatever variety is chosen for breeding. Unlike ducks and fowls, geese eggs are seldom used for table purposes; yet the best layers should only be kept if we wish to get a good percentage of goslings from each goose. Geese thrive best on wet or marshy land, and as there are plenty of such waste places in different parts of the Colony, geese would be a good stock to run on them. Geese will pay where the owner has a good paddock or open pasture where they can travel to gather the bulk of their food. They eat a lot of grass—ten want the same area of grassland as one cow—and are very fond of harsh tussocky grass that most other animals will not eat.

To get the best profits, the owner should not depend on the geese finding their own living—they should get a meal of grain at night;

and just before, and during the laying season, they should get a breakfast of soft food (bran and pollard), as well as their nightly supper of grain.

In choosing breeding birds, see that they are purely bred and are up to the standard weights of the breed. The breeders should be kept rather thin than fat. They require very little food in spring and early summer when grass is plentiful. As to the number of geese that should be mated with a gander, opinions differ. I found good results from two geese to a gander the first year, and three to four the second year. One of the largest geese-raisers in England says:—"A gander should not be mated with more than four geese to get good results. Geese live to a good age, cases being authenticated where individual birds have lived over thirty years. Geese, after their tenth year, should be replaced by younger birds. I believe in disposing of them after the sixth or eighth year. Young ganders are better for breeding purposes than young geese. The best results are got from a young gander and three or four year old geese. Old ganders, after their fourth year, should be disposed of, as they become quarrelsome and unproductive. Young geese seldom go broody the first year, and the goose in her second year should give a return of fifteen goslings. It is always best to gather the eggs soon after the goose leaves the nest, and as each five or six are gathered they may be given to a hen, or, better still, a Muscovy duck, to incubate. The average weight of geese eggs is about 5½ oz.

The first few eggs gathered from geese are generally of poor fertility; yet I always like to give them to a hen for seven or eight days, when they can be tested, and infertiles taken out. After the goose has laid a dozen eggs it is best to keep an eye on her when laying, for when she commences to be fixing her nest and delaying on it, you may be sure she is preparing to go broody. It is best to give her ten or twelve eggs when she has fixed up a good nest with plenty of downy feathers in it. Geese eggs cannot be properly hatched in incubators, the results not being as uniform or as good as the natural incubation. The eggs hatch in twenty-eight to thirty days, and the percentage of goslings lost after hatching should not be over two or three. The only danger is when the goslings are hatching, some mothers become restless and fidgety, so crush them.

It is a good plan to take the goslings from the nest soon after hatching, wrapping them in flannel, and when all are hatched the strongest may be put back with the mother, and the remainder when strong enough. The goslings do not eat much for the first two or three days, but will soon nibble at young green grass, which should, if possible, be saved for them. Early hatched goslings must be kept warm; if they get chilled they will never grow into good geese. As soon as they leave the shell they should be wrapped in flannel and kept cosy and warm until all are hatched. In the evening they can be given back to the Muscovy duck or hen. The best food to give young goslings is a good chicken food, with a good proportion of green stuff added to it.

Fattening Geese.

I have never heard of this being done in the Colonies, the usual fattening methods being left to the goose itself. All geese to be fattened should be penned on a nice dry site, and the size of pen will depend on the number to be fatted; for twenty-five geese 25 feet square will be ample. The water should be supplied in buckets, half-full at a time; they can only then get sufficient for drinking, which is all they require. The birds should be kept as quiet as possible, and are very shy of strangers or strange dogs. When first penned they should be fed moderately, and in a few days the rations may be increased up to the fattening ration. It does not do to break them off suddenly from green food; so it is best to supply them with a little, gradually lowering the amount to none. Odd birds, that do not show good appetites and are not fattening, may be removed to a grass run for a week or two, and then again penned.

The best food for fattening is good maize meal and meat scraps, in the proportion of one-part meat scraps to four-parts meal. Feed in the morning what the birds will eat up clean, midday the same, and at night whole maize, all they will eat. It will not matter if there is a little left, for the birds generally eat it before morning. I would not advise leaving any soft food on the ground after a meal; it is best to remove it, and try and gauge their appetite so that there will be none left.

It takes about three weeks to fatten a young goose, and the feeding must be regular and proper to do it in that time, and their water must be replenished three times daily to have them do well.

On the Continent, thousands of geese are fatted annually. As many as 150,000 pass through the markets of Strasburg in a year. In America, also, the birds are properly fattened, as the breeders know the difference in price to be gained between a properly fattened and a green goose.

In Europe, the livers of extra fatted birds are sold, and command as high as £1 per dozen. Matthieu, the cook of Cardinal de Rohan, it is said, was the first who suggested the use of the liver of the goose for pies. From the livers the famous Perigord pies, or *pâté de foie gras*, are made.

Goose farming and goose fattening have fallen off greatly in England. From old accounts we read : "It was not uncommon for a man to keep a flock of 1,000, each of which might be expected to rear on an average seven goslings. The flocks were regularly taken to graze and water, the same as sheep, and the man who herded them was called a goose-herd or gezzerd. The birds were plucked five times in the year, and in the autumn flocks were driven to London or other markets. They travelled at the rate of about a mile an hour, and would get over nearly 10 miles a day." When geese are to be travelled a distance in Europe, they are driven through warm tar, and then through sand, which boots them for the journey.

Bench-grafting Resistant Vines.

FOR several years past the Department has devoted a great deal of consideration to the establishment of nurseries, at which viticulturists will be able to procure, in sufficiently large numbers, cuttings and rooted vines of the most approved phylloxera-resistant varieties with which to rework their vineyards, and so provide in what is generally recognised as the most effectual way against loss from inroads by the dreaded pest. At Howlong, Campbelltown, Wagga, and other Departmental plantations, cuttings and rooted plants can be purchased at a nominal rate. The reworking of vineyards in this way is, however, a big undertaking, comparatively new to the majority of New South Wales growers, and it is therefore thought that some details from a report of a series of experiments in one form of this work, conducted at the Berkeley Agricultural Experiment Station in California, by Messrs. Bioletti and Dal Piaz, may prove of interest:—

"The conviction that the vineyardist has to deal with the phylloxera as a factor in the success or failure of his business becomes stronger every day. This applies both to the grape-grower who already has bearing vines and to the intending grape-grower who is engaged in planting his vines. Each succeeding year sees new vineyards and new localities attacked, and grape-growers who believed their vines safe on account of the richness or sandy nature of their soils, the practice of irrigation, or the isolation of their vineyards, are gradually being forced to change their belief by the sad fact of the death of their vines. Yet there are still many who fail to realise the true nature of this disease, and even now there are growers who are planting varieties of vinifera on their own roots in localities adjacent to infected districts and even in the infected districts themselves.

Even those who are thoroughly persuaded of the necessity of establishing their vines upon resistant roots are in doubt as to what species or variety to choose.

When the phylloxera first invaded the lower parts of the Sonoma and Napa valleys, over twenty years ago, the vineyardists were completely unprepared for it and unable to combat it in any way; so most of them allowed the insect to have undisputed sway, with the result that the vineyards disappeared. A few of the more intelligent growers, however, tried the method, first practised in France, of planting resistant stocks. The principal varieties planted were Riparia and Lenoir. Other varieties were planted in small quantities by a few growers, but most of them are at present of little interest. The results varied widely. Though a certain number of vineyards were fairly or even perfectly successful, the majority were total or partial failures. This lack of general success was due to three principal causes :

1. Many of the soils and locations were unsuitable for the growth of either Riparia or Lenoir.
2. The Riparia cuttings used were not of one variety, some being very small growers, unable to support a large vinifera.
3. The Lenoir is not sufficiently resistant in all soils, and therefore failed to give full crops on any but the best soils.

To these should be added, in many cases, ignorance of the methods of planting and grafting resistant stocks.

Ten or fifteen years later the coast valleys south of San Francisco, which the vine-growers had hitherto considered immune for some mysterious reason, were attacked. They were just as unprepared as the vine-growers of Napa and Sonoma had been when their vineyards were attacked. It is in order to prevent any further unpreparedness and consequent costly mistakes that vine-growers of uninfected locations are earnestly advised to commence *now* to test the most promising resistant stocks on their own places, in order to determine which of these is most suitable for the conditions of the soil, climate, and moisture that exist there. This is especially true of such localities as Fresno and others in the lower San Joaquin Valley, where there are large stretches of contiguous vineyards as yet uninfected.

The phylloxera is as menacing a foe to the "raisin-grower" as to the "wine-grower," and it would be well worth while for every vineyardist in California, not only to test various resistants, but also to learn the methods of bench or cutting grafting and all the various processes of establishing a vineyard on resistant roots. Then, when the insect enters his own or his neighbour's vineyard he will know exactly what to plant and how to plant it, and not be obliged to experiment for three or four years or trust to the experience of someone else whose conditions may differ in some way from his and thus run the risk of making costly failures.

The work of the Experiment Station in this line for the last two or three years has been to establish some general principles to guide the individual grower in his own attempts and to narrow the scope of his experiments in order that he may not waste his time on methods and varieties which have already been proved valueless. Our conclusions have been based on observations of our own experiments and also of the successes and failures of grape-growers in various parts of the State. These observations have so far been directed principally to :

1. The adaptability of various resistant varieties to different conditions of soil, climate, and moisture.
2. The best method of grafting for various varieties and conditions.
3. The growth of various vinifera varieties upon various resistant stocks.

The problems presented by the phylloxera were studied by Professor E. W. Hilgard very early at this station, and a certain amount of attention has been given by the station since then to methods of extermination of the insect and to resistant stock. The results of this work having already been published, the present article deals only with the work done during and since 1896. In that year Professor A. P. Hayne, of this department, imported the following resistant varieties, which were recommended as the best in France for soils similar to our California soils: Rupestris St. George, Riparia Gloire de Montpellier, Riparia grande glabre, Riparia Martin. These varieties were as widely distributed over the various vineyard districts as possible, and particular satisfaction was given by the first two mentioned.

In 1897 the station continued this work of distribution, and put upon its *Distribution List* Rupestris St. George, Riparia Gloire de Montpellier, Riparia grande glabre, and Solonis. A more limited distribution was also made of Rupestris Martin, Rupestris Mission, Rupestris Ganzin, Champini, and of three hybrids of Rupestris crossed with Riparia, viz., Rup. × Rip. 101^{14}, Rup. × Rip. 3,306, Rup. × Rip. 3,309.

In the same year the station published an appendix to the Viticultural Report of 1896, entitled *Resistant Vines*, by Professor Hayne, in which was given a summary of what is known in France of the practical selection and adaptation of resistant vines, and also of the methods of grafting adapted to these vines. During the years 1898 and 1899 the two varieties which seemed to have given the most general satisfaction, and for which there was the most demand, were again placed upon the *Distribution List*. These varieties were Rupestris St. George, and Riparia Gloire de Montpellier.

In 1898 the station decided to make a series of practical experiments with these recently-imported resistants and on various methods of grafting, in order to bring the matter before the vine-growers of California in a practical form, and also to throw light on some doubtful points. This it was enabled to do by the public spirit of Mr. J. K. Moffitt, of the First National Bank of San Francisco, who kindly allowed us to use a portion of his vineyard at St. Helena, Napa County, for our experiments.

These experiments were planned on a somewhat elaborate scale, but unfortunately were almost a complete failure, on account of the bad condition of the resistant cuttings when they arrived from France. There were imported 9,300 cuttings of various varieties, and of these about 85 per cent. were completely spoiled. They were packed with the greatest care, but had somewhere been exposed to too much heat (probably on the steamer) and had suffered a fermentation which had completely blackened the pith and inner bark. These were planted out in the nursery without grafting, but failed to grow. The remainder were a little better, but were full of dark streaks, showing that they also had suffered from the heat, but in a less degree. These were grafted, and the ill-success of the grafts was undoubtedly due to this bad condition of the stocks. This showed the danger of importing large quantities of cuttings from so distant a place, and it was determined for the next year's experiments to use only cuttings grown in California.

Grafting.

Preparation of Cuttings for Grafting.—The Rupestris St. George cuttings used for grafting-stock were in excellent condition at the beginning of the grafting season, as they were kept under cover in moist sand during the winter. The cuttings were less than two feet long, rather short-jointed, and generally too thick at the lower end and too thin at the upper for grafting. This was doubtless due to the dry summer, which resulted in a short growth, and it was rarely possible to obtain more than one graft from a cutting. The sizes used for grafting varied from ¼ to ½ inch diameter. The thin tips which could not be used for grafting were put out in the nursery for rooting.

The cuttings were all treated in the same way for the various experiments, as follows: They were cut into sections of from 6 to 9 inches; the lower cut was made through the knot of the bud; the last internode of the upper end was left as long as possible, as the internodes were of rather short length, sometimes scarcely long enough for the grafting cut. Special care was given to the perfect removal of all of the buds on the stock, a deep cut being made in order to remove not only the main bud, but also the small adventitious or dormant buds which surround its base and which often grow out when not carefully excised and form suckers which grow at the expense of the graft. The cuttings thus prepared were sorted into three sizes, according to their thickness, put up in bundles, and placed vertically in a tub of water, so that the lower end was covered with water, the cuttings thus remained fresh and sappy, which facilitated greatly the making of cuts. The cuttings remained in the water until they were needed for grafting, that is to say from 6 to 18 hours.

The washing and placing in water had also the object of cleaning the cuttings from all adhering dirt and sand, which would blunt the edge of the sharpest grafting knife in a short time.

The scions were prepared in a similar way, with the exception, of course, that the eyes were left. Two kinds of scions were needed for the experiments; one with one eye, the other with two eyes. The first kind was cut through the second knot so as to leave the eye protected by a closed internode, which on the one hand prevented penetration of moisture and of fungi, and on the other hand drying-out of the part above the eye. Scions of the second kind (with two eyes) were treated differently in order not to make them too long, the upper cut being made about an inch above the second eye.

The scions were also sorted into three sizes corresponding with those of the stock, tied up in bundles, and put in water to keep them fresh and sappy.

Methods of Grafting.—Before grafting, the cutting for both stock and scions having been carefully sorted into three sizes, and the eyes of those of the stock cut out deeply with a sharp knife in order to prevent the production of suckers, the greatest care was taken to prevent the slightest drying-out of the cuttings and afterwards of the grafts.

The raffia used for binding the grafts was soaked in a 3 per cent. solution of bluestone (copper sulphate) for one day and then hung up to dry. Before using, it was thoroughly washed in running water to remove the superfluous bluestone. The raffia was cut into short pieces of 10 to 12 inches and then kept in a box, moist and ready for use.

The grafting knife was not of the pattern generally used in California, but was one especially constructed for Champin and English tongue-grafting. It had a wooden handle, 4½ inches long, to give the hand a firm grasp, a straight and very thin blade of excellent steel which was easy to sharpen and which kept its edge for a considerable time. A good hone and a razor strop were used for sharpening the knife.

The object of the experiment in methods of grafting was to ascertain the advantages and disadvantages of the two most commonly-practised methods, viz., the English graft and a modification of the old Champin graft. The first is universally used in European vine-nurseries, the latter is less practised there, but is frequently used in California.

English Cleft or Whip Grafting.—This method was applied in the usual way, as shown in Fig. 1. The stock and scion were chosen of equal size and were cut at the same angle. The length of the cut surface, in cuttings of solid texture and full size, was about three times the diameter of the cuttings, that is to say, the cut was made at an angle of about 19 degrees. This may be taken as the maximum angle that can be used practically. For smaller cuttings the length of the cut was relatively somewhat greater, being about four times the diameter, or about 14 degrees, which may be taken as the minimum angle which should be adopted. The tongues were made by a

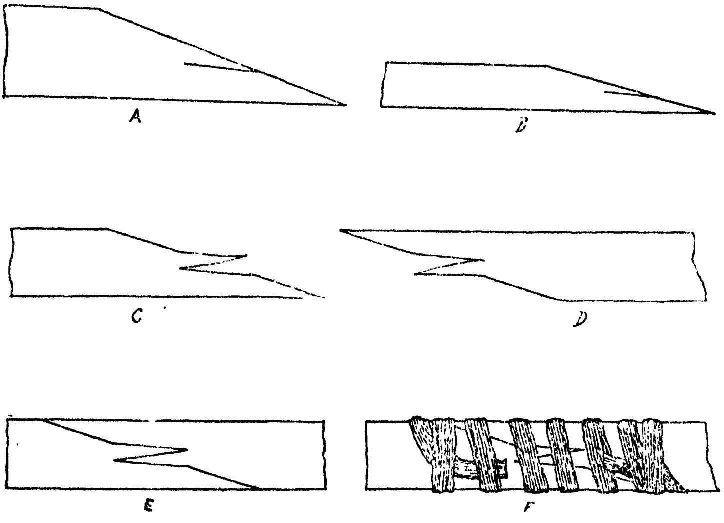


Fig. 1.

longitudinal cut, care being taken *not to split* the wood, and usually commenced at about one-third the distance from the sharp end of the cutting and to a depth about equal to the diameter. Thus, when two cuttings were placed together, the sharp end of one corresponded exactly to the thick end of the other, so that no portion of the cut surface was exposed, and the maximum contact was obtained. The object of the grafter in making his cuts is to make them as straight as possible, but it will be found that a cut made by the most skilful hand is slightly concave. This is, however, no objection, as this extremely slight concavity is useful in allowing for the slight swelling in the middle, due to the insertion of the tongues. This is probably one of the reasons why hand grafting is generally more successful than grafting with a machine, as a machine makes a cut which is absolutely straight, and the ends have thus a tendency to be drawn away from the cut surface of the other cutting. The cut for the tongue is not made quite parallel to the grain of the wood in order to minimise the danger of splitting.

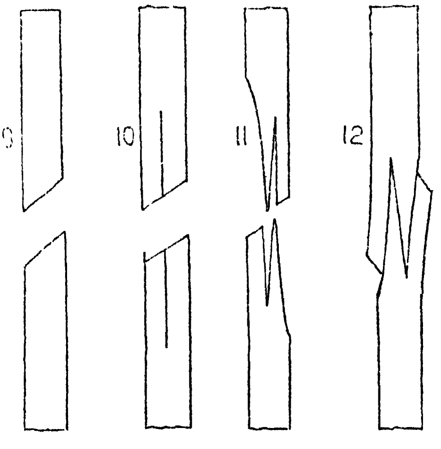


Fig. II.—Champin Grafts.

9 12. Method of making Champin graft.

Champin Graft.—Perhaps the commonest method of grafting used in California for small vines or cuttings is a modification of the Champin method. The Champin graft is made as shown in Fig. II below. The modified method is a compromise between the true Champin graft and the English tongue graft. It is made in a way similar to that described for the latter, but the tongue is made much deeper and the end of the point (see Fig. II, No. 12) projecting over the cut of the opposite cutting is cut off.

The Champin graft is based on the theoretical principle that the greater the surface of contact between the two cuttings the greater the chances of union. Thus in the English graft the amount of possible contact is theoretically only about half that of the Champin. The latter is apparently twice as great as the former. In practice, however, it is found that the contact in the English graft can be made so much more perfect than in the Champin graft that the actual contact is usually greater in the former than in the latter. Moreover, the strip of bark on the long tongue of the Champin graft is more likely to become detached or injured than the well-supported bark on the English graft; and finally, the exposed cut at the end of the scion is almost sure to emit strong roots, while that on the stock prevents the complete and thorough union which is possible with the English graft. The tongue, therefore, should be reduced to the minimum—that is to say, should be as short as possible, while giving solidity to the graft until union takes place. For purposes of comparison, parallel experiments were made with both methods.

Another method, new and not thoroughly tested as yet, was tried with a few Rupestris St. George cuttings, Mondeuse being used for scions. This method originated in France, and is called "End-to-End" grafting. Its nature is shown in Fig. III. The ends of stock are cut at an angle of about 70° and are held together by a piece of galvanised iron wire which is pushed into the pith of each piece. The number of successful grafts was low, but those which did unite made such excellent unions that the method seems worthy of further trial. It is especially promising for machine grafting.

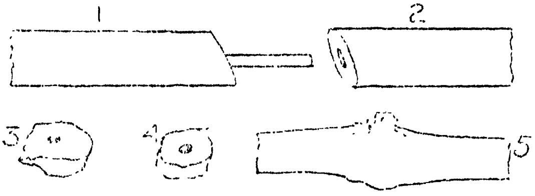


Fig. III. - End-to-End Graft.

1, 2. Method of making the End-to-End graft.
3, 4. Cross-section through the union of the above graft, showing how completely the stock unites with the scion on all sides.
5. Union of End-to-End graft.

Binding Grafts.—Raffia, treated as explained on page 967, was used for binding the grafts. The raffia seemed to have deteriorated somewhat during the twelve months it had been allowed to hang in an open shed. It was weaker than usual and some of it rather brittle. It was cut into lengths of about 12 inches.

It has been shown that the grafts would do better without any binding but for two reasons: *first*, because it is difficult to handle unbound grafts without disturbing the union; and, *second*, because the callus does not form simultaneously on all parts of the union, and the first formed tends to push apart the stock and scion, thus making it difficult or impossible for all parts to unite. The object, then, in binding is to use as little raffia as is compatible with the thorough firmness of the union. The free ends of both scion and stock should be made firm with about two turns of the raffia, and the rest with wide spiral turns which leave as much of the union in direct contact with the sand as possible. The sand, while keeping the union sufficiently moist, does not completely exclude the air, which is necessary to the formation of healing tissue. A somewhat closer tying than this was adopted in these experiments, on account of the weakness of the raffia used.

The grafts were tied in bundles of ten and then treated in various ways to aid their uniting.

Methods of Aiding Callusing.

The main reason for callusing the grafts before they are put in the nursery is that we can have more perfect control of the conditions which favour the formation of callus. Those conditions are an even and not too low temperature and a moisture, content of the soil in which the grafts are callused, not exceeding 10 per cent. and not falling below 5 per cent.

Two methods of obtaining those conditions were tried:

1. *Callusing in Sand.*—The sand used was taken from Napa Creek and was very suitable for the purpose. The grafts were put in the sand nearly vertically in bundles of ten, in rows. The sand was moistened sufficiently to give it the compactness necessary for making the piles. The location of the sand pile was chosen on the south side of a building, which protected the sand from the north winds and rendered it possible to give the grafts the maximum amount of sun.* A layer of about 4 inches of sand was put on the bottom and then the grafts were put in vertically and covered up as soon as they came from the grafting bench. The tops of the grafts were covered with a thin layer of sand (about 2 inches). The whole pile of sand with the grafts was then covered with a waterproof cloth, in order to protect the grafts from excessive moisture and to maintain the even temperature of the sand during cold weather and at night. This cover was easily removable in order to facilitate watering if necessary, and to make it possible to warm the pile on sunny days. This arrangement, somewhat improved, is shown in Fig. IV.

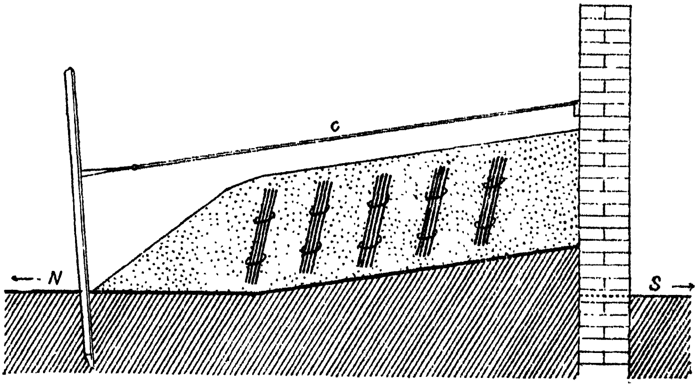


Fig. IV.—Callusing Bed.

The grafts were put in the sand from 7th March to 18th March, the time of grafting.

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* In California. Here the location would be on the northern side.

2. *Callusing in Straw or Moss.*—To test this method, 360 grafts were placed in straw, moss not being obtainable at the time. Moss is considered somewhat better, on account of its superior hygroscopic power. The method of layering the grafts in straw was as follows: A large box without cover was laid on its side; a layer of about 2 inches of chopped straw was placed on the lower side and then a single layer of grafts. This was repeated until the box was full. The grafts were so placed that the scion was nearest the bottom of the box, which was then turned upright and still more straw pushed in between the layers of grafts until they were tightly packed. The box was then placed in the sand pile, 2 inches of straw placed on top, and the whole covered with sand, 1 inch of sand being placed over the top layer of straw. The straw was moistened before being used for layering the grafts.

All the grafts were left for from six to eight weeks to callus, and then planted out in the nursery during the first week in May.

Planting Grafts in the Nursery.

Planting Immediately after Grafting.—There is no doubt about the disadvantage of planting freshly grafted vine-cuttings out in the open nursery, as we have there no practical means of sufficiently controlling temperature and moisture. But in order to have definite data in regard to this method in comparison with a preliminary callusing with more or less perfect control of temperature and moisture, the following experiment was tried:—Three hundred and sixty grafted cuttings were planted out in the nursery directly after they were grafted. The soil of the nursery was in good condition. In planting, a trench was dug about 18 inches deep and 15 inches wide. The bottom of the trench was then filled in for a few inches with well-pulverised top soil, in order to facilitate the penetration of the roots. The grafts were placed 4 inches apart nearly vertically, in two rows (one on each side of the trench), sand being previously placed on each side in order that the bases of the stock should be in favourable condition for root formation and growth. The trench was then completely filled by putting in soil and sand alternately in such a manner as to surround the grafts completely with sand. The point of union of scion and stock was placed at a level with the surface of the soil, and was also carefully surrounded with sand. Sand was then heaped completely

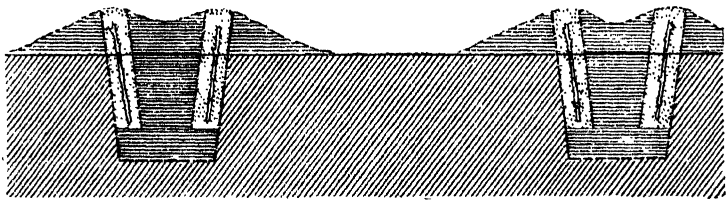


Fig. V. Method of Planting in Nursery.

over the scions and the rest filled in with soil, thus making a bank which covered the grafts to a depth of about 2 inches; as shown in Fig. V.

The reason for completely covering with sand was to prevent the scions from being dried out by the wind.

Planting the Grafts after previous Callusing.—The grafts were planted in the nursery after they had been from six to eight weeks in the callusing bed.

When the grafts were taken out of the callusing pile it was noticed that the unions of those which had been buried on the south side were much more complete than those buried on the north side, showing the effect of heat in promoting the formation of healing tissue. In the warmer parts of the pile the buds of the scions had started—a disadvantage which was, however, more than counterbalanced by the good callusing, as was proved by their subsequent better growth. The only other difference noted was that the Riparia stock had developed more rootlets than the Rupestris at this time.

The grafts were planted out in the nursery in trenches about 18 inches deep and 14 to 15 inches wide, as already described. The grafts were planted in a manner similar to that described on page 970, with a few modifications which were found to be necessary. The grafts first planted were put in the soil so as to bring the unions just level with the soil surface. But the loose soil soon settled about 2 inches, so that the unions became actually deeper. The grafts planted later were placed with the unions about 2 inches above the surface to offset this settling. Moreover, some further precautionary measures had to be taken to prevent the soil from drying-out too much near the grafts. It was found best to make the bank of piled-up earth wider by putting more soil at the sides so as to preserve the moisture of the soil.

The soil was moist enough when the grafts were planted, but the sand had to be moistened before putting into the trenches. A thorough ploughing and harrowing were given the hard soil between the rows in order to prevent excessive evaporation.

The nursery received but little care after the grafts had been planted. The soil received the same cultivation as that of the neighbouring vineyard, was weeded once, and the grafts were irrigated in July.

Removal of Scion-roots and Suckers from the Stock.—About the middle of July the earth was carefully removed by means of a shovel, and then the sand was taken away from the unions, partly by means of a trowel, partly with the hands, as circumstances required. The smallest rootlets were still soft and could be rubbed off by the hand; the older and firmer roots had to be cut with a sharp knife. Great care was taken not to disturb the unions of the grafts, as they were still very brittle.

Few suckers were found, as the eyes of the stock had been carefully cut out before grafting. In cases were the suckers came from the deepest eye it was found necessary to dig down to the base of the whole graft in order to cut the shoot at its base, as well as to properly remove the dormant eyes. The removal of roots was done without injury to the grafts, as they were covered up before they had a chance to dry out and the soil was irrigated immediately after; so that the grafts looked as fresh as ever the next morning.

The soil was found dry to a depth of from 5 to 6 inches, but the soil below this had preserved sufficient moisture to keep the unions of the grafts from drying, as they were all in the moist region. The sand on the surface became very much heated in the middle of the day, which may account for the many tender young shoots and leaves which were found dry and withered. The second eye at the base of the scion had in most of these cases developed new shoots, so that the injury done was only in retarding the vegetation of the burnt plants.

A thorough irrigation was found necessary at this time in order to prevent injury from the drought and heat of summer. The water was run in little ditches about 1 foot from the grafts, and so applied that the soil around the unions was never thoroughly water-soaked, which experience has shown to be deleterious to the graft. The soil was cultivated as soon as dry enough after irrigation. The raffia in many cases was rotten already.

Condition when Scions and Suckers were cut.—The following observations were made during 14th to 18th July, when the roots of the scions and the suckers were cut:—

English grafts with scions of two eyes; 180 Zinfandel on Rupestris St. George. Almost all the grafts had started to grow; about 50 per cent. of the grafts showed roots on the scions; 162 grafts had started, that is 90 per cent.

English graft with scions of one eye; 180 Zinfandel on Rupestris St. George. A lower percentage than of the above had developed shoots (78 per cent.); but the roots on the scions were less developed and fewer in number.

Champin grafts with scions of two eyes; 180 Zinfandel of Rupestris St. George. The scions had well-developed shoots, but also a good many strong roots on the bases of the scions. Of the 180 grafts, 165 were growing, that is about 92 per cent.

Champin grafts with scions of one eye; 180 Zinfandel on Rupestris St. George. This lot was better developed than that with two eyes left on the scions; less strong roots were found on the scions, but only 150 were growing, that is about 83 per cent.

Champin grafts with scions of one eye; 180 Zinfandel on Rupestris St. George; *planted out immediately after grafting.* The unions of the grafts that were growing seemed to have joined very well; the soil near to the scions was dry, so that but few roots had developed; the 75 grafts growing made but a low percentage of the whole, about 42 per cent.

Champin grafts with scions of two eyes; 180 Zinfandel on Rupestris St. George; *planted out immediately after grafting.* The grafts were in about the same condition, but showed a higher percentage of growing grafts; of the 180 grafts, 98 were growing, that is about 54 per cent.

Champin grafts with scions of one eye; 180 Zinfandel on Rupestris St. George; *grafts callused in the straw.* The scions showed small and few roots, and the number of growing grafts was 154, that is about 85 per cent.

Champin grafts with scions of two eyes; 180 Zinfandel on Rupestris St. George; *grafts callused in the straw.* The grafts of this and the foregoing experiment (callusing in straw) looked the best of all the grafts made, and had very well developed shoots, with an average length of 10 inches. The proportion of growing grafts was 90 per cent.

America grafted with Zinfandel; English graft with scions of two eyes on one-year-old rooted stock. The grafts showed good growth; six grafts of ten had started, that is 60 per cent.

Munson grafted with Zinfandel; one-year-old rooted stock, scions of two eyes, English graft. The grafts showed good growth; a few only showed small rootlets on the scions; eleven, or 85 per cent., were growing.

Champin grafted with Zinfandel; one-year-old rooted stock, scions of two eyes, English graft. The scions did not take in most cases, the proportion being about 30 per cent.

Elvicand grafted with Zinfandel; one-year-old rooted stock, scions of two eyes, English graft. The grafts showed very poor growth, and only about 29 per cent. growing at all.

Mondeuse on Rupetris St. George; Champin graft, scions of two eyes. The shoots are found to be short, about 5 or 6 inches long. Only a few rootlets were found on the scions, and many of them were already dead. The proportion of growing grafts was about 63 per cent. Altogether the Mondeuse were growing less vigorously on Rupestris St. George than the Zinfandel.

Lenoir grafted with Zinfandel; English graft, scions of two eyes. Many of the grafts did not grow, they were found dry and dead; the few growing were backward in development; the nourishment came, apparently, from the reserve food in the cuttings, as there were few or no roots on the stock. Only 28 per cent. were growing.

American Ruländer grafted with Zinfandel; English graft, scions of two eyes. Neither scions nor stock had developed roots; a few were growing somewhat by means of reserve food; in all 19 per cent.

Herbemont grafted with Zinfandel; English graft, scions of two eyes. A few started to grow (about 24 per cent.), but no roots were found on the scions or the stock.

Cunningham grafted with Zinfandel; English graft, scions of two eyes. No roots had formed on the scions. The growth was small, and only 26 per cent. showed any.

Riparia Gloire de Montpellier grafted with Zinfandel; Champin graft, scions with two eyes. The green shoots were 5 to 6 inches long, some even smaller (that is, shorter) than those on Rupestris St. George. But few rootlets were found on the scions. The proportion of growing grafts was 58 per cent.

Tokay on Rupestris St. George; Champin graft, scions of two eyes. The grafts were very well developed, showing abundant foliage. Not many roots were found on the scions, and 87 per cent. were growing.

Ferrara on Rupestris St. George; Champin graft, scions of two eyes. The grafts showed very good growth; but many roots were found on the scions, and most of them were already well developed. The proportion growing was 96 per cent., which is higher than in any of the other experiments.

Condition when Raffia was cut.—The following observations were made from the 28th to the 30th of August, when the raffia was cut:—

In the case of many of the grafts the raffia should have been cut earlier (two to three weeks), the raffia having prevented the proper development of the covered unions. In all those cases where the raffia had prevented the proper enlargement of the union, though the parts below and above the raffia showed good development, the scions had developed strong roots. These roots favoured, in some cases, an unusually heavy growth of the green parts, often as much as 2 to 3 feet. In these extreme cases, when the raffia was cut and the roots of the scions removed, the thin, undeveloped union was unable to support the heavy top, and broke off at a touch of the spade or a puff of wind. In the first row worked there was a loss of about 3 per cent. from this cause. It was found, before the other rows were touched, however, that this loss could be avoided by a heavy pruning-back of the green shoots. This not only lessened the weight of the top, thus preventing breaking, but diminished the evaporating surface of leaves, which was too great for the roots of the stock after those of the scion had been removed.

The raffia on many grafts (about 20 per cent.) was quite rotten, and cutting was not needed; very good unions could be observed in all these cases. In other cases the raffia did not show any signs of decaying, and was strong enough to prevent the development of good unions, and was therefore cut. The raffia of the grafts which were planted out immediately after grafting was, contrary to all expectations, still strong, apparently because nearer to the surface and therefore drier. Undoubtedly the raffia should have been cut at least one month earlier on these.

Condition when Grafts were removed from Nursery.—The following observations were made from the 26th to the 30th of December, when the grafts were taken out of the nursery:—

English grafts with scions of two eyes; 180 Zinfandel on Rupestris St. George. Most of the unions were very well joined. The average length of the shoots was from 1 to 2½ feet; the wood was mature. The roots were well developed, and grew mostly straight down to a depth of 3 feet, the fine rootlets even deeper—4 or 5 feet; 83 grafts had made good unions—that is, 46 per cent.; 11 grafts showed imperfect unions.

English grafts with scions of one eye; 180 Zinfandel on Rupestris St. George. The difference in the development of the grafts with two eyes and with one on the scion was very slightly in favour of the first, and the shoots as well as the roots of the successful grafts looked nearly alike. Fifty-one grafts had developed fine unions—that is, 28 per cent. Twelve grafts made imperfect unions. This experiment shows clearly the advantage of using scions of two eyes for grafting, as 20 per cent. of grafts were lost by using scions with only one eye.

Champin grafts with scions of two eyes; 180 Zinfandel on Rupestris St. George. The unions with this method of grafting did not develop so well as those of the English graft, and though the number of passable unions was 116, they were not of so perfect a character as those of the first experiment, and the number of imperfect unions was greater. The growth of the shoots was short when compared with the parallel experiment with English grafting. The root-system of the stock was well developed, the main roots always going down, with the smaller rootlets mostly horizontal. The main roots had an average length of 3 to 4 feet, the shoots a length of about 2 feet. There was 64 per cent. of good unions.

Champin grafts with scions of one eye; 180 Zinfandel on Rupestris St. George. The unions in this experiment were somewhat inferior to those of the last. A good many roots had formed; all were of smaller diameter than those mentioned above; but, like them, going straight down with an average length of 3 feet. The roots were, as a whole, less developed than those of the foregoing experiment. The quality of the unions in this case was decidedly inferior to the parallel experiment with English grafts; 58 per cent. of the grafts made sufficiently good unions.

Champin grafts with scions of two eyes and one eye, as in the last two experiments, but planted out immediately after grafting without previous callusing in sand; 360 Zinfandel on Rupestris St. George. The unions of the grafts in this experiment were of medium quality, and an especially high amount of second-class grafts were noticed in the lot of 180 grafts with two eyes. The grafts with scions of one eye did, in this experiment, comparatively better than in other parallel experiments, as there was less difference in the percentage of unions; 28 per cent. of the grafts with two eyes left on the scions had made good unions, and 24 per cent. of the grafts with one eye, while in the first case there were found 17 per cent. of grafts with imperfect unions, and in the other only 9 per cent.

Champin grafts with scions of two eyes and one eye, as in last two experiments, but callused in straw; 360 Zinfandel on Rupestris St. George. The unions of the grafts in this experiment were in every respect inferior to those of the grafts callused in sand, though the shoots were well developed (average length, 2 feet) and the roots proportionately. There was very little difference in the general appearance of the grafts with two-eye scions and of those with one-eye scions. The percentage of grown and well-developed grafts of the two kinds was also close together. Eighty-eight grafts grew of the first kind with two eyes—that is, at the rate of 49 per cent.; and seventy-six grew of the second kind—that is, 43 per cent. The second-class grafts with imperfect unions grew at the rate of 17 per cent. and 8 per cent. respectively.

America grafted with Zinfandel; ten one-year-old roots, scions of two eyes, English graft. Only three grafts had started, and showed imperfect unions and poorly-developed shoots.

Munson grafted with Zinfandel; thirteen one-year-old roots, scions of two eyes, English graft; nine of the thirteen grafts grew—that is, 69 per cent. The unions were mostly good and strong. The grafts showed a strong root-system; but the shoots did not show a proportionate growth.

Champini grafted with Zinfandel; ten one-year-old roots, scions of two eyes, English graft. Only a few showed growth, and the unions were very imperfect.

Elvicand grafted with Zinfandel; seven one-year old roots, scions of two eyes, English graft. None had made a good union.

Mondeuse on Rupestris St. George; 910 Champin grafts, scions of two eyes. The unions of this kind formed better than those of Zinfandel on Rupestris St. George; most of them were well formed and strong. The shoots were well developed and the roots more numerous than those of the grafts of Zinfandel on Rupestris St. George with the same kind of treatment. The water-level at the time of digging was at a depth of 3 feet, so that the roots could only be followed to a depth of about 4 feet, but they undoubtedly went deeper. It was also observed here that the roots of the Rupestris St. George penetrated the soil vertically through alternating layers of compact soil and layers of coarse but fertile sandy soil without the slightest deviation, and sent out an equal growth of secondary rootlets into all layers, except that most of the finer rootlets and root hairs were formed on the lower parts of the main roots, 3 and more feet deep; 452 grafts made first-class unions—that is, a total of 54 per cent. Moreover, about 10 per cent. made unions that were more or less imperfect.

Lenoir grafted with Zinfandel; ninety-six English grafts, scions of two eyes. Most of the grafts had formed no roots and only three had started growth, one of which was a strong, good graft with long, thick roots.

American Ruländer grafted with Zinfandel; twenty-six English grafts, scions of two eyes. The grafts were all dead.

Herbemont grafted with Zinfandel; 21 English grafts, scions of two eyes. The grafts were all dead.

Cunningham grafted with Zinfandel; twenty-seven English grafts, scions of two eyes. Two grafts showed good unions. They had a well-developed root-system with thick roots, which grew horizontally at first and then straight down. Only 7 per cent. grew in all.

Riparia Gloire de Montpellier grafted with Zinfandel; 100 Champin grafts, scions of two eyes. The unions were not of very good quality. The shoots were short and thin and altogether of scanty growth. The roots were mostly thin and branching, but often very long. Most of the main roots did not penetrate the soil, but grew more or less horizontally, and scarcely deeper than 1½ feet below the surface. It was noticeable that the roots of the Riparia Gloire de Montpellier followed the softer layers and streaks in the soil, and lacked the penetrating power of the Rupestris St. George. Only 15 per cent. of the grafts had made good unions, and 12 per cent. of them showed imperfect unions.

Tokay on Rupestris St. George; 100 Champin grafts, scions of two eyes. The unions were nearly all good and strong. The average length of the shoots was 3 feet. The grafts showed a finely-developed root system with strong, penetrating roots, which went directly down into the subsoil. The percentage of well developed grafts was 60, which is better than the Zinfandel and Mondeuse with the same kind of treatment. There were found only 6 per cent of imperfect grafts.

Ferrara on Rupestris St. George; 100 Champin grafts, scions of two eyes. The unions of this lot were nearly always found to be well formed, and they were really the best unions in the whole plot. All the shoots were more than 2 feet long, many 3 feet, and a few even 4 feet. The root-system showed the same fine development, and was fully proportionate to the upper development of the grafts; 75 per cent. of the grafts made perfect unions and 9 per cent. made imperfect unions.

TABULAR Review of Grafting Experiments.

	Proportion of Unions.		
Nature of Experiment.	1st Class.	2nd Class.	Remarks.
Champin grafts	44 per cent.	11 per cent.	
English cleft grafts	37 ,,	6 ,,	Unions very complete.
Scions with two eyes	46 ,,	13 ,,	
Scions with one eye	38 ,,	7 ,,	
Grafts callused in sand	61 ,,	7 ,,	
Grafts callused in straw	46 ,,	12 ,,	Unions weak.
Grafts not callused	26 ,,	13 ,,	Growth rather short.
Zinfandel on Rupestris St. George	64 ,,	11 ,,	Good growth.
Mondeuse on Rupestris St. George	54 ,,	10 ,,	,,
Ferrara on Rupestris St. George	75 ,,	9 ,,	Very strong growth.
Tokay on Rupestris St. George	60 ,,	6 ,,	Strong growth.
Rupestris St. George as stock	64 ,,	11 ,,	
Riparia Gloire de Montpellier as stock	15 ,,	12 ,,	Small growth.
Herbemont	0 ,,	0 ,,	
Lenoir	1 ,,	2 ,,	
Cunningham	7 ,,	4 ,,	
American Ruländer	0 ,,	0 ,,	
Munson, rooted vines	69 ,,	0 ,,	Good growth.
America, rooted vines	0 ,,	30 ,,	
Champini, rooted vines	0 ,,	0 ,,	
Elvicand, rooted vines	0 ,,	0 ,,	

The figures in the above table must not be taken as representing the exact relative values of the various methods and varieties compared, but taken in connection with the following remarks they may be considered as valuable indications:—

A word of explanation is perhaps necessary with regard to certain figures. The 44 per cent. of successful grafts given as the average for Champin grafts and the 37 per cent. for the English cleft grafts are somewhat low on account of the fact that they include various experiments, some of which were comparative failures, and made only for the sake of comparison, and not to attain the maximum number of good grafts.

The proportion of successful Champin grafts, as shown by the table, is slightly greater than that of the English cleft. The successfull English cleft grafts, however, were considerably superior to the other in the matter of completeness and strength of union. The lower percentage is probably due to the fact that the English cleft grafts were placed in the northerly end of the callusing sand heap, where the temperature was too low. (See page 970.)

The experiments with two-eye and one-eye scions on the whole were in favor of the use of two eyes. The additional chance of success given by two eyes when the first eye is injured by frost or other cause no doubt accounts for the higher percentage of success in this case. In the case of the grafts planted out immediately after grafting, the one-eye scions made on the whole the strongest growth. This seems, however, to be due to the fact that the upper eye of the two-eye scions started and broke through the sand early enough to be killed by the spring frosts, while the one-eye scions, being more deeply buried, were later in emerging, and escaped the frost. This gave the latter an earlier start and, therefore, a longer period of growth; for there was a check of growth and an interval of waste time in the former case between the killing of the upper bud and the starting of the lower. The remedy here, therefore, if this explanation be true, is a deeper layer of sand over the scions, and not the use of only one eye.

The difference between previously callusing the grafts in sand, and planting them directly in the nursery as soon as made, is very striking. Those previously callused produced 61 per cent. of good unions, while the others produced but 26 per cent. There was also a difference in the growth of the grafts in favor of those callused in sand. The grafts callused in straw were a disappointment; for, though when planted out they seemed to have callused more successfully than those in sand, they produced only 46 per cent. of sufficiently good unions, and these were weaker than those of the grafts callused in sand. The cause of this was probably the growth of moulds and wood-rot fungi around and in the unions while they were in the straw.

The influence of scions of different varieties on the growth of the grafts is well shown by four varieties tested; the Mondeuse, though quite satisfactory, gave a smaller percentage of successful grafts than any of the others. They started later than the Zinfandel, and though the growth and root-system were somewhat stronger, the wood was not quite so well matured. The Zinfandel did very well, giving 64 per cent. of good grafts and making good growth. The black Ferrara, however, made almost phenomenal growth, and yielded 75 per cent. of first-class unions. The growth of the Tokay was almost equal to that of the Ferrara, but the number of successful grafts rather less—60 per cent. An average Zinfandel graft upon Rupestris St. George in comparison with an average Tokay upon the same stock shows that the larger growth of top is accompanied by a corresponding development of the root-system. This dispels the doubt that our very heavy-growing varieties, especially table and shipping grapes, would succeed upon resistant vines, at least as regards Rupestris St. George.

The greater adaptability of Rupestris St. George for bench-grafting than of Riparia Gloire de Montpellier is well shown in these experiments. Where the Rupestris St. George gave 64 per cent. of first-class grafts, the Riparia Gloire de Montpellier gave only 15 per cent.

This is due in a great measure to the difference in texture in the wood of the two species. The Rupestris has thick, firm wood with short joints and small pith, while the wood of the Riparia is softer, more pithy, and longer jointed. In consequence of this difference it is much easier to make a well-fitting, firm union with the Rupestris than with the Riparia. It would appear from this experiment that grafting in the vineyard when the Riparia is 2 or 3 years old would be the best method for varieties of this species.

Of the other stock tested, including Lenoir, it is plain, with the possible exception of Munson, that they are unadapted to this method of grafting. This is to a great extent due to the difficulty of making roots with many of these varieties and their consequent failure to properly feed the scion. The Munson not only gave a high percentage of first-class grafts, but the unions were particularly good. As this variety's resistance to phylloxera has not been thoroughly tested, however, this success in grafting must not be construed as a proof of its utility as a resistant stock.

The effect of failing to cut the raffia or other binding material early enough in the season is well shown by the middle graft of Fig. VI. The graft, as can be seen, had made a perfect union, but the raffia had been imperfectly removed, one or two turns having been left uncut. This is of course an unusual case, as when the raffia is cut in one place it is usually loosened completely. The same thing occurs, however, when the raffia is not cut at all, except that the constricted part is longer, as is the case with the two outer vines. The swelling of the vine above the constriction is due to the difficulty which the food, elaborated by the leaves, finds in passing the part where the bark is compressed by the raffia. The large swellings on the two outer vines below the raffia are due to another cause. They are doubtless indicative of disease, and resemble very closely the black-knot which attacks older vines, especially in wet soils. The nature of this disease is not well understood, but as it usually accompanies an excess of water in the soil, it was doubtless due in this case to heavy rains in the late spring after the grafts were planted.

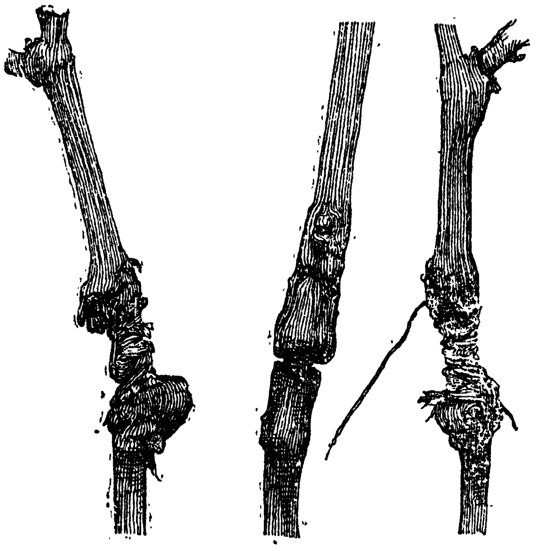


Fig. VI.—Effect of Black-knot and of failure to cut the Raffia.

The accumulation of food material above a constriction of the bark and the consequent starvation of the lower part and root-system are similar to what occurs when a vine is girdled. Fig. VII shows an excellent example of this. The vine represented is a Rupestris St. George in the spring after the year it was planted. The first year it made an excellent growth, as evidenced by the roots on the lower part.

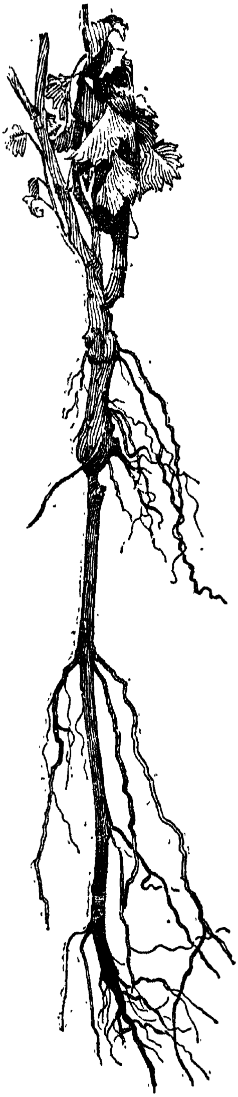


Fig. VII.– Effect of Wire-worms on Young Vine.

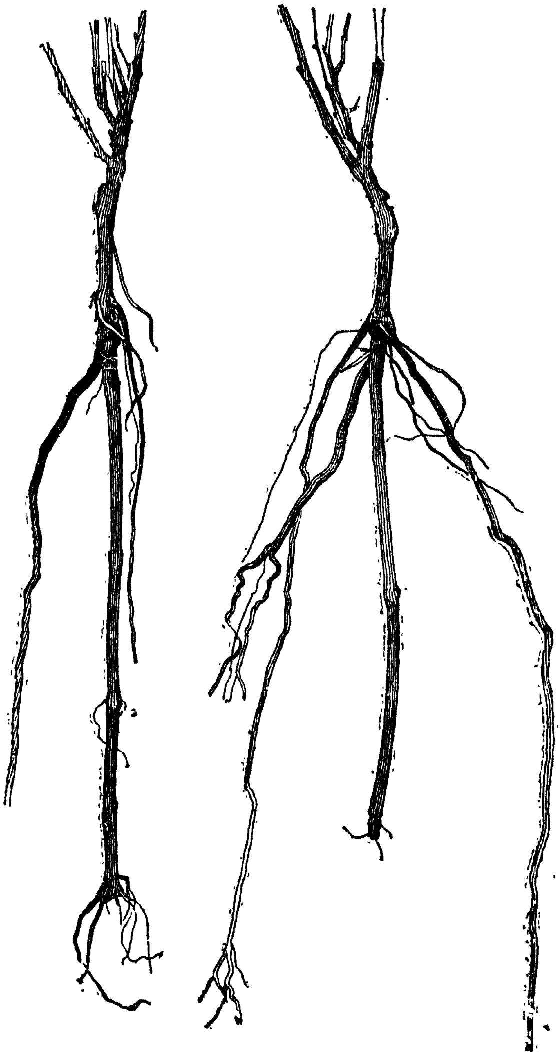


Fig. VIII. Effect of failing to cut off the roots of the Scion.

In the spring of the following year, however, the growth, though at first vigorous, soon stopped and the leaves became yellow. On digging up the vine it presented the appearance shown in the figure. The upper part of the vine had grown to twice the thickness of the previous year down to a point about 4 or 5 inches below the surface. Below this point there was no growth at all, and although the roots were still alive they were no larger than the year before. A closer examination revealed the fact that, at the point where the change took place, the vine had been completely girdled by wire-worms, which had eaten off the bark for about half an inch.

It is unusual for wire-worms to attack such plants as the vine, but the explanation was quickly found. The land in which these Rupestris St. George cuttings were planted had been in grass and hay for several years before, and the roots of grasses being a favourite food of wire-worms, they had increased to large numbers. In the spring of the year in which the vines were attacked the land was so thoroughly and carefully cultivated that not a weed was left for the many wire-worms still left in the ground. For this reason they were obliged to attack the only living vegetable substance present. Vines injured as badly as that in the figure died, but the rest were saved by simply digging around each vine and destroying the wire-worms, which were congregated near each vine at about the same distance from the surface.

The effect of neglecting to cut the roots which are sent out by the scion is shown in Fig. VIII. In the vines shown there, the union was good and the top vigorous, but owing to the fact that the roots of the scion were allowed to grow, the stock failed to develop. The descending food, which is necessary to the growth of the roots, entered the roots of the scion more easily than it could traverse the irregular and abnormal tissue of the union. Thus there was left a vinifera on its own roots with the resistant stock starved and killed.

Comparative Experiments in Rooting Cuttings of Resistant Stocks.

Rupestris St. George.—580 cuttings were planted out in the nursery on April 18, 1899. Most of those cuttings were the thin tips which could not be grafted on account of their small diameter. No attention beyond the ploughing and cultivation given to the vineyard was given them during the growing period, except that they received one irrigation and one hoeing in June. The roots were 9 months old when taken from the nursery. The average length of growth of the shoots was 2 feet, usually several were formed on a single plant. The root-system was well developed, and from four to six main roots could be counted in most cases on one vine. All the roots were long, strong, and tough, and grew to a depth of 3 to 5 feet; 480 cuttings had made good rooted vines—that is, 83 per cent. of the cuttings planted.

Riparia Gloire de Montpellier.—Forty cuttings were planted and received the same care as the cuttings of the Rupestris St. George. The vines showed scanty growth when taken out of the soil. The average length of the shoots was from 1 to 2 feet, but only a few developed on each vine. The root-system was entirely different from that of the Rupestris St. George. Very few of the main roots went down to the moist regions of the soil; most of the main roots were superficial, growing about 1 foot below the surface and sending out many small rootlets. The roots were not strong, but rather brittle, and broke easily; thirty-two cuttings out of forty were well rooted—that is, 80 per cent.

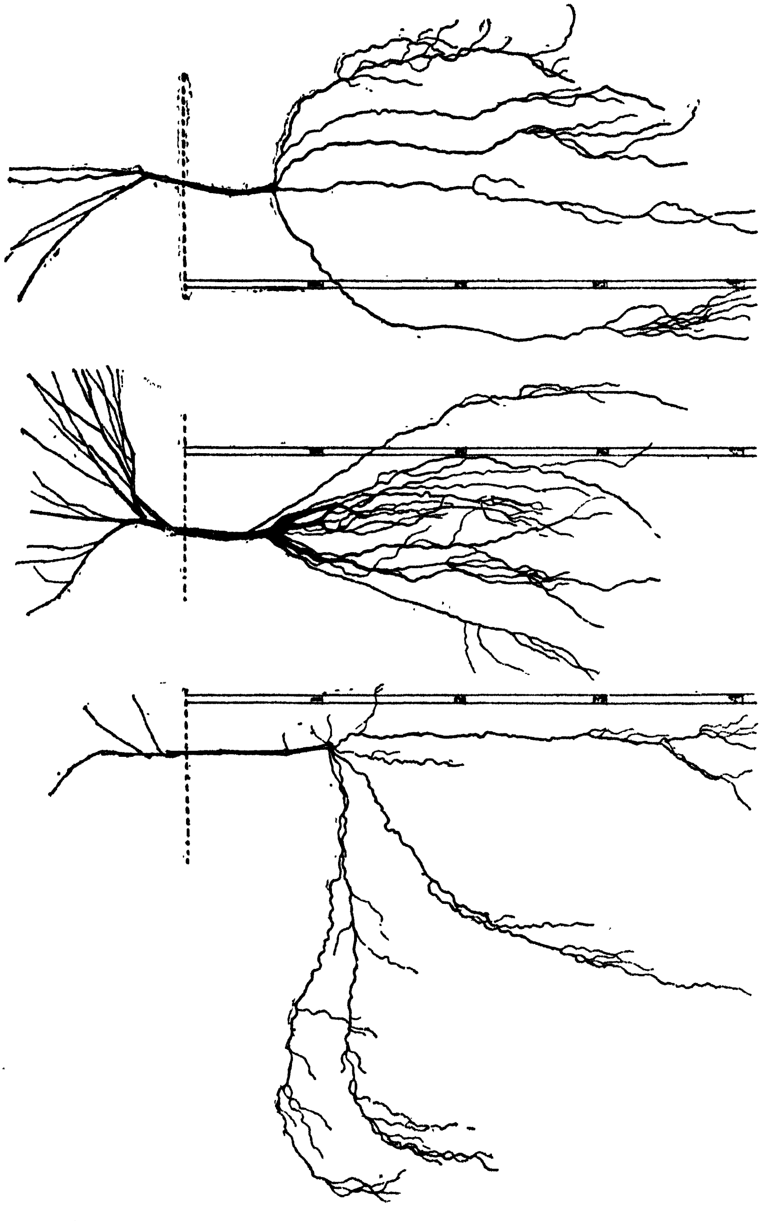
Solonis.—Forty-five cuttings were planted in the spring and were treated like the preceding. The following observations were made on the vines when taken out in winter: The shoots were thin and of an average length of 2 feet. The roots were well developed and grew down to the moist depths, although not so straight as the roots of the Rupestris St. George. The small rootlets and roothairs were only formed at the end of the roots, 3 to 4 feet deep in the soil. The main roots were thicker than those of Rupestris St. George and Riparia Gloire de Montpellier.

The difference in character of the root-systems of Rupestris, Riparia, and Solonis is well shown by Fig. IX. These are average specimens of the vines rooted at the St. Helena plot in 1899. The tendency of the Riparia to send out horizontal, or even slightly rising roots, is illustrated. In extreme cases the roots were found to start toward the surface at an angle of 45°, and after rising in this way for several inches to become horizontal. About two-thirds of the roots took this horizontal direction, and the remainder went down at various angles, some being nearly vertical.

The cause of the failure of the Riparia in the upper part of the Napa Valley is evidently to be found here. The heat and continued drought of summer penetrate to those horizontal roots, destroy the roothairs, and deprive the vine of water exactly at the time it is most needed. The more deeply penetrating roots are too weak and too few to supply the amount of water needed by the evaporating leaf surface. This lack of adjustment of the supply of water to the demand is increased when the Riparia is grafted with strong-growing vinifera varieties. This is evidenced by the many grafted vines which die in their second or third year.

The deeply penetrating roots of the Rupestris, shown in the figure, explain the resistance of this species to drought. All the roots in this young vine penetrated deeply into the soil in a direction more or less approaching the vertical. As the vine grows older, as we have found by the examination of three-year-old Rupestris St. George vines, secondary roots are sent out in a direction more approaching the horizontal. These utilize the upper layers of soil, but as they constitute but a small part of the whole root-system any injury to them is not severely felt by the vine.

An injury to the lower roots, however, is more injurious to the Rupestris. This explains the unsuitableness of this species for badly drained soils, and for soils where the water-level is high for a long time in winter and spring, and especially for those irrigated districts where the water-level rises during the growing period of spring and summer. The standing water causes the roothairs on the main part of the root-system to decay, and, deprived thus of its only means of obtaining water, the Rupestris dies of drought as truly as does the Riparia when the main part of its rootlets and roothairs are destroyed by the heat and dryness of summer.



Solonis, nine months old.

Rupestris St. George, nine months old.

Riparia Gloire de Montpellier, nine months old.

Fig. IX.—Root Growths of Resistant Stock Compared.

The strong, sturdy growth of the Rupestris St. George, as compared with the comparatively slender growth of what seems to be the best of the Riparias, is also well shown by the figures. This makes the Rupestris St. George particularly valuable as a stock for our heavy-growing varieties of vinifera. This heavy growth of the grafts on Rupestris St. George has been found in France to have a tendency to make them bear poorly and "go to wood." This, however, may be considered a "good fault," as it is easily counteracted by more generous pruning, by leaving a larger number of buds, and thus, by diverting the whole vigour of the vine into a larger number of shoots, decreasing the vigour of each and increasing their fertility. Some grape-growers, especially in the south of France, report enormous crops on vines grafted on Rupestris St. George.

Following are descriptions of the three varieties of resistant stock which at present give the most promise of being adapted to California. The leaves of the three varieties are shown on the title page:—

Riparia Gloire de Montpellier. (Synonyms: Riparia Portalis, Riparia Michel, Riparia Saporta.) This is one of the most vigorous of all the varieties of Riparia and is equalled only by the Riparia grande glabra and the Scribner Riparia. The stem or trunk is thick; canes spreading, long, with elongated internodes of medium thickness, slightly bent at the nodes (giving the canes a faint zigzag appearance), of a light nut colour, smooth, rather shining, and a little pruinose near the eyes when the wood is well ripened; young shoots of a light purple; leaves large to very large, thick, elongated, somewhat bulging between the main nerves, dark green and shining on the upper surface, lighter green on the underside, with a few stiff hairs on the ribs; the petiolar sinus is open, U-shaped; the upper lodes are well marked by large, elongated teeth, the lower barely marked at all; the teeth are sharply pointed and in two series (see figure on title page). The roots are slender and spreading like all varieties of Riparia (see Fig. IX). Resistance to phylloxera, 18.

Rupestris St. George. (Synonyms: Rupestris du Lot, Rupestris Phénomène, Rupestris Sijas, Rupestris Monticola, Rupestris St. Georges érigé, Rupestris Lacastelle, Rupestris Colineau, Rupestris Reich, Rupestris Richter.) This variety is extremely vigorous and produces a very strong, thick stem; canes erect (the main laterals spreading), with short internodes and prominent nodes; leaves small, wider than long, with metallic sheen, undulating edges, and relatively thin, those of the laterals often very small and somewhat bronzed near the tips. In hot weather the leaves fold in two at the mid-rib, but less than most varieties of Rupestris. The roots are long and strong and not so slender as those of other varieties of Rupestris. Resistance to phylloxera, 16.

Solonis. A vigorous, strong grower; canes spreading, with patches of whitish hairs, which become light brownish-gray in autumn; leaves of medium size, upper lobes marked by very long teeth, lower lobes lacking; teeth very long-acuminate, in two series; petiolar sinus widely open. The leaves are covered with white web-like hairs above when young, becoming almost glabrous when old, except on the ribs and petiole. Roots strong and intermediate in direction between those of Riparia and Rupestris (see Fig. IX). Resistance to phylloxera, 14.

Summary.

1. Every grape-grower should insure against phylloxera by testing the most promising resistant vines on his own place and by learning the methods of bench-grafting.
2. It is unsafe to attempt operations on a large scale with cuttings imported from abroad, on account of the danger of injury to such cuttings on the journey.
3. A cutting-graft of suitable varieties makes as large and vigorous growth as a simple cutting, so that by the method of bench-grafting no time is lost in establishing a resistant vineyard.
4. Resistant varieties which are difficult to root but easy to graft when old, such as Lenoir, should not be bench-grafted.
5. Care in callusing, planting, and treatment in nursery, and especially in keeping the grafts moist from the time they are made till they are in the callusing bed, will enable even an inexperienced grafter to obtain at least 60 per cent. of good, grafted plants.
6. The bluestone should be washed off the outside of the raffia before tying, or it will injure the bark of the graft.
7. Callusing in sand insures more perfect unions and a larger percentage of successful grafts than planting directly in the nursery.
8. The moisture in the callusing bed should not be excessive, and the temperature should be relatively warm.
9. The growing grafts should be watched closely in order to see that the roots of the scions are removed before they become large, and that the raffia is cut before it strangles the graft.
10. The English cleft graft is preferable to the Champin graft, because it gives more perfect unions and can be made with more accuracy and rapidity.
11. Scions of two eyes are preferable to those of one eye, as they give more chances of success.
12. Rupestris St. George seems to be remarkably adapted to California soils (except the heaviest clays) and conditions, and is to be preferred to any variety yet tested here wherever deep penetration of roots is possible and desirable.
13. All the eyes of the Rupestris stock should be cut out deeply and carefully.
14. A vigorous and large-growing vinifera scion promotes an equally vigorous and large growth of Rupestris St. George used as stock.

Condition of the Wheat Crops in the Western Districts.

R. W. PEACOCK.

DURING September so many unfavourable reports were received as to the condition of the early-sown wheat crops in the Narromine district, and the opinions expressed as to the causes by various farmers affected were so conflicting, that I obtained permission to investigate the matter. The results are embodied in the following report:—

Condition of the Crops.

I purpose, in viewing the areas visited, to divide them into two divisions, the first including those in the Narromine and intermediate districts to Nevertire, which have had sufficient moisture throughout the developing stage of the crops; the second division comprising those west of Nevertire and intermediate districts to the Coolabah farm, which have been more or less affected by drought.

In the first division, dry conditions must be completely eliminated in drawing conclusions, and the exceedingly moist conditions taken into consideration; whilst in the latter, the lack of sufficient moisture materially affects the question.

In the first division the early crops, sown during the end of March and the beginning of April, were completely withered after having attained a height of about 2 feet. The crops sown at the end of April and later were green and flourishing; whereas all self-sown wheat which had grown amongst them to the height of 2 feet or over was affected as seriously as the earlier sown crops.

These crops were found to be languishing about the middle of July.

In the second division the crops were affected differently, being tip-withered in patches irrespective of height, with the exception of some of the later sown crops which had not developed sufficiently to exhaust the limited amount of moisture at their disposal, and, with the exception of isolated instances, the partial failure could, without doubt, be attributable to drought.

I therefore purpose narrowing the question down to the first division, and to review the conditions of that area and their effects upon the crops.

The exceptionally favourable season permitted of farmers sowing a portion of their crops early, and also encouraged a very rapid tender growth. The mildness of the early winter, with an abundance of rain and absence of frosts, until the beginning of July, permitted the early crops to reach the height of about 2 ft. to 2 ft. 6 in., with self-sown wheat well out in ear to the height of 4 feet. The seasonable cold snap which prevailed throughout the Colony early in July, with its accompanying snow-storms and subsequent frost following upon the unseasonable weather which prevailed in these districts during June, proved too much for the crops, which had reached a certain height and stage, and resulted in their becoming frost-bitten.

The favourable conditions before alluded to induced an undue proportion of moisture in the tissues, which became frozen by the frost, and upon being frozen expanded, resulting in a complete rupture of the cells, and the death of the vegetative organs above ground. In most cases the roots have sent out a phenomenal undergrowth, which in two months was 2 feet high, in some instances appearing above the dead original growth.

Why the crops of a foot high and under were not touched by the frost may be explained by the three following causes, acting separately or conjointly—most probably conjointly:—Firstly, the soil would retain an appreciable amount of heat, radiated from the sun during the day, which would be given off during the earlier and greater part of the night. This, in conjunction with the envelope of moisture, which would be considerable in such a moist season, would keep the surface considerably warmer than if absent, and create a warmer superficial envelope, militating largely against the action of frost, in a greater degree near the surface of the soil than at a distance of 2 feet or further from the surface.

Secondly, the earlier crops had reached a stage in their development of possessing less expansive tissue, especially at the nodes or knots, of the stem, and the rupture at such places would naturally be greater. Upon examination of these nodes two months after frosting, the signs of rupture were more apparent than in any other portion of the plant.

Thirdly, it is probable that owing to the greater demand upon the soil moisture by the earlier crops, it would decrease the proportion available for the protective envelope before mentioned, leaving the surface dryer, and consequently colder during frosty weather. Taking all these into consideration, and the conditions inducing the predisposition of the plant to the action of frost, would fully explain the effect without attributing it, as has been done by a few farmers, to parasitic fungi and insects. The parasitic fungus spring-rust (*Puccinia dispersa*) was present, but not in sufficient quantity to produce the effect, and the symptoms were decidedly at variance with the well-known action of this parasite.

The conditions inducing predisposition to frost would be admirably adapted to the spread of rust, and it was only reasonable to expect its presence, but must be completely rejected as one of the causes.

There also were present upon the decaying plants saprophytic moulds which had entered the ruptured tissues, the conditions after frosting being very favourable to their development. That they had not the power of becoming parasitic may be inferred from the fact that the second growth was not affected, and in no instance did I find signs of similar ravages upon living plants. A few farmers attributed the damage to aphides; but although they were in great numbers upon some portions of the affected crops, and also upon some patches of the green ones, which had become lodged, were not in sufficient numbers to cause the mischief, and cannot be considered seriously.

The serious effects of the frost were not confined to the cereals, citrus and other susceptible trees being more severely cut than in former years. It may not be that the temperature fell lower than in preceding years, but the effects were more serious, owing, no doubt, to the sudden change of the conditions early in July. The effect also was not greater upon one variety of wheat than another, as the height and stage of development had the most to do with it. Such varieties as Steinwedel and Allora Spring suffered most on account of this reaching a certain stage sooner, being earlier wheats ; but other slower varieties, self-sown, which were over 2 feet high, were killed as well. It might therefore be wise for farmers to keep the early varieties for their late sowings, instead of sowing them in March, and the beginning of April. For fuller remarks upon this question, I would refer them to the September *Gazette*. Such serious effects by frost have not been known before, especially upon the wheat crop before it came into ear, and may not occur again for many years; but the better plan would be for farmers to prevent, wherever possible, their crops from becoming winter-proud, either by sowing the early varieties later in the season, and the longer seasoned wheats earlier, or to keep them within bounds by feeding them down by sheep.

The early crops which had been so treated escaped this season.

GROWING VEGETABLES FOR PARIS MARKETS.

A GOOD many visitors to the Paris Exhibition have remarked the magnificent specimens of vegetables displayed. Mr. J. McKay says that in the vicinity of Paris thousands of acres are devoted to market-gardening. In that locality intensive farming has reached such a pitch that a good deal of the soil is made to order ; and by the terms of his lease the tenant sometimes carries the soil away with him, just as he does his hotbed frames, water-pipes, and machinery. The suburban farmer usually begins with old forcing-beds as a basis for his soil, but may make the foundation of sawdust and shavings, or any material that will furnish in time vegetable mould, and fertilisers are added with great liberality. On this combination he grows vegetables in the open air to the value of £200 per acre, and pays immense rents —sometimes as high as £32 per acre. At Cherbourg much of the land has been regained from the sea, and upon this land some 15,000 tons of vegetables are produced and sent to the British markets. On the peninsular of Riscoff, in Brittany, is the unique sight of 26 miles of market-gardens in a straight line.

Bees, and How to Manage Them.

ALBERT GALE.

Swarm-catching and Hiving—*continued.*

I concluded last month with the advance swarms of the season. These, almost without an exception, are numerically strong, and give far more satisfaction to the bee-keeper than late ones. As a rule, fairly early swarms will again throw off swarms late in the season. The only way to obtain strong swarms is to prepare for such in the previous autumn. Put the bees up for the winter with all the adjuncts that will keep that end in view. These adjuncts may be briefly summed up in a few words: hives proof against cold and damp; the swarm strengthened to their uttermost; and food supplied to carry them well on to the spring.

To accomplish this should be the aim of the bee-keeper at all times. The only thing that will then mar his success will be the seasons. These he cannot control; but all the adjuncts referred to are in his power.

Old queens are more disposed to swarm, or are more frequently seized with the swarming impulse, than are the second swarms or casts. These are always headed by queens of the season. It is these swarms that issue forth from the first swarms of the season—technically termed "maiden swarms"—that give the bee-keeper a lot of trouble. It is not far to go to understand the reason of these maiden swarms. Queens that come forth with the spring swarms are at the least from eight to twelve months old. During the previous season these queens laid eggs that produced female or working bees only. These last year's queens are in a condition to lay drone-producing eggs. The production of drones acts as a stimulus for queen production. Where an old queen is hived in a bar-framed hive where foundation-starters only are used, there will always be found a superabundance of drone-cells constructed. With the second swarms or casts it is not so. The combs built by these are constructed of small-sized cells (workers').

A bee-keeper's ideal should be, as far as possible, to prevent swarming. The building of comb and the preparation for swarming are two luxuries that bees delight to indulge in; but they are far too expensive for the bee-keeper's profits, because both comb-constructing and swarm-producing are carried on at the expense of the honey stores. It must be remembered that these after or maiden swarms, and also casts, are largely made up of young bees that have seen very little field labour, and the withdrawal of these from an established colony is a heavy drain on the labour market of the aforesaid colony; whereas, if they can be kept as inmates of what I may term their own home, they will add to the exchequer of their owner.

A mercantile person would consider cent. per cent. a superb profit for business purposes, and a sheep or cattle farmer would rejoice at a hundredfold as the increase of his stock for the year; and so should a bee-keeper.

As there are mechanical aids to produce swarming, so there are mechanical aids to prevent it. Of course, if the bee-keeper's ideal is in obtaining a large number of hives of bees, then he should husband all casts and after-swarms; but, I must repeat, it can only be done at the expense of his honey profit. True, it is possible, in a very short space of time, to increase an apiary to some hundreds of colonies by means of natural and artificial swarming, providing the locality will carry such a stock as it regards honey-producing plants. Even if some of the colonies of this extensive increase be weak, with proper management they can be brought up to the required strength; but honey must not be expected during the period of strengthening the weak colonies.

Let us see what are the mechanical aids to prevent swarming. We all know, or should do so by this time, that old queens are drone-layers, and the older they become the more drones they produce. Now, nothing will prevent an old queen from becoming a drone layer, any more than 'we can prevent an old mammal from becoming sterile. You may put in whole sheets of foundation comb, and cut out drone cells by the thousand, but the queen will lay drone eggs in spite of you. If she has nowhere else to deposit them she will put them in the worker cells. Drones are always kept alive at the expense of the storage of honey. They have only one use—one of the aids to reproduction. When that is accomplished the bees themselves get rid of them. During this period they have been occupying valuable room by their superabundance, and devouring food that would be far better used in the rearing of workers. All this can be prevented by getting rid of drone-laying queens. But the early spring swarms are always accompanied by a drone-laying queen, and she will very soon commence her drone-laying proclivities. Here you will see the necessity of trying your apprentice hand at queen raising. As early as the season will admit, have an overplus of young laying queens on hand, ready to replace the queen that accompanied the first swarm. This is the first and most important mechanical aid to prevent swarming. The second is like unto it, but not nearly so effective. A queen develops from egg to maturity some five days sooner than the worker; therefore, about every fourteen days take out and examine every comb for constructing queen cell, or developing queens, and destroy them. A keen knife will do it. I always use my finger and thumb and pinch them out.

If, from any cause, you may have been unable to procure young laying queens (although they are always to be procured from dealers in season, and almost out of season), or to examine the combs for queen cells, there are almost sure to be late swarms to deal with. This country is one of the most likely in the world to produce casts and after-swarms, and these are the ones that will give you trouble. In all probability, when they rush from the hive they will go further afield than the spring swarm, before they settle; in fact, it is these swarms that become the vagabonds, and are found hanging on fences and elsewhere about Christmas time. One of the first swarms of bees I ever saw on the wing was one of these vagabonds, high up in the air and hurrying across the meadow. I tried to follow, but a wide and deep brook stopped me. In these early days of my beekeeping experience, well do I remember tin kettling—ringing them down we called it—a cast for the best part of an hour, the bees attempting to settle first here and then there, and, finally, nowhere ; while they suddenly took it into their heads to alter their course, rapidly gathered together, and with one or two wide evolutions in the air, they shot upward, were soon lost to sight, and it was good-bye to my swarm. It is this peculiar trait in their character that gives all the trouble. These thousands of bees that escape in this way are so much loss to the colony they came from. If they can be kept in the hive it means more extracting for the beekeeper. The prevention of these casts means having a strong colony through the winter; and a strong colony through the winter means a strong early swarm in the following spring. How can we keep them at home ? Even this cannot always be done. These casts are too frequently led by a virgin queen. Where these after-swarms alight you will have to go through the same process of hiving as described last month, and return them to the hive. But, you say, will there not then be two queens in the one hive ? Very probably there will. One must be destroyed. Either you must destroy the one with the cast, or there will be a fight with the two queens in the hive, and then it will be the survivor of the battle that will henceforth reign. But how can we find a queen-bee out of the thousands that are in a swarm ? There is a little trouble in doing this. The after-swarms and casts, as a rule, are accompanied by virgin queens. These are much smaller than fertile queens, and too frequently escape notice. If you are acquainted with the form of a virgin queen, by watching the swarm after it clusters, you may sometimes find her running about on the outside, and occasionally threading her way in and out amongst the crowd. To do so you must have an experienced eye. After you have shaken them out and they have settled into the reception box, by spreading a cloth on the ground and throwing the bees on to it, then let them re-enter the box by crawling towards it, you are often enabled to pick her up. All this requires patience—a commodity no beekeeper can afford to be without.

Pig-farming on the Paddock System.

W. H. CLARKE.

II.

FROM the articles that have appeared in the *Agricultural Gazette*, it has perhaps been made clear that the requirements of the bacon-curer are pigs that, at about seven months' old, are possessed of a long, fairly deep side, with plenty of prime rasher-meat that does not run too thick on the back, or papery towards the belly.

Something has already been said about the way in which it would be possible to provide ample supplies of properly diversified food in the shape of crops on which the pigs could be depastured until they reach the topping-off stage. This is the crucial period, and before a farmer can feel sure that he is going to get satisfactory results from the adoption of any system of feeding, or the general supply of fodder according to any specific formula, it is necessary for him to study closely the effects of a wide variety of foods and combinations until he can strike the happy medium that will, in nine cases out of ten, yield profitable returns. One is scarcely likely to overlook the fact that the effect of wholesome food of any kind is governed by the breed of the pig, some breeds having a tendency to run to fat, while others are naturally as stringy as a harp. How to avoid or correct these extreme tendencies is the problem the breeder who wishes to be successful has to solve. More than half the battle is overcome when we can secure the exact pure type or cross that will fit into the natural conditions of our particular district. By crossing it may be possible to practically fix the tendencies of meat and fat production, in so far as the mere geographical position and proportion of them are concerned; but it is to food, exercise, and general treatment that we must look for the production of a carcase capable of being turned into high-grade bacon. A side of pig-flesh that mathematically complies with all the requirements of the curer is worthless if the lean is in undue proportion and the fat will not set. A side of pork is also of little profit if, by some inexplicable condition set up in the pig by improper feeding, the drying-out weight in curing gets down below a certain minimum. All these, and many more, are among the matters that Mr. Valder is endeavouring to settle by systematic experiments at the Hawkesbury Agricultural College.

So far as good pig-blood is concerned, the pig-farmers in New South Wales have had brought within easy reach, by the departmental importations of stud pigs of all the best strains, all the facilities possible for the establishment of a herd on a sound foundation. The manufacture of bacon for export is almost an untried quantity; and so as we go along, it will perhaps be well for everybody interested in the building up of what must soon become a lucrative and very large trade to see what is being done in connection with the important question of foods in countries that have already attained a secure footing in the big markets. Most of the details that are now given are based on work that has passed the experimental stage, and the whole of the information is the result of systematic efforts made all over the world to produce the highest quality of bacon at minimum cost. Some of the conclusions may be wide of the mark for our conditions; others may require some little modification to become applicable to difference in climate and surroundings.

Maize.

Maize is everywhere recognised as one of the cheapest and best of pig-foods. It cannot be given exclusively, however, throughout the lifetime of the pig without an injurious softening effect upon the bacon.

It can be most profitably used either as whole grain or as meal in the topping-off pen.

Until the animals reach the topping-off stage, any maize fed to them should be given in combination with milder, non-heating, and less fat-producing foods, preferably pasturage.

Peanuts.

There is not much information available as to the results of feeding peanuts to pigs in this Colony. In the United States, for many years, this crop has been regarded as a first-class one for the purpose. Speaking of it in a report published by the Alabama Agricultural Station in 1898, Mr. J. F. Duggar, M.S., says: "The peanut is certainly worthy of a foremost place in the list of hog-crops. The Spanish variety can be used as an early crop, and also for planting after oats; the common running variety for the late fall crop. It is highly desirable to arrange a succession of peanut crops rather than to have large areas ripen at the same time, for in wet weather Spanish peanuts will not remain long in the ground after maturity without sprouting." In a series of experiments with peanut pasturage Mr. Duggar employed six Poland-China pigs. At the beginning of the experiment their total weight was 184·3 lb., and at the end of six weeks they weighed together 380·7 lb.—a gain of 196·4 lb. In another test to determine the results of peanut pasturage *versus* corn (maize) meal, three lots of three Essex pigs each were employed. The first lot were hurdled on peanut pasturage, and given daily all the maizemeal they would eat, and at the end of four weeks had made a total gain of 38·6 lb. The next three were depastured on peanuts, and received no other feed. At the end of four weeks these had gained in all 21·1 lb.; while the third lot, confined to a pen and given nothing but ground maize, lost 5·1 lb. during the four weeks.

At the close of that experiment another test, extending over six weeks, with peanuts *v.* cornmeal was commenced, and the same pigs were used. The first lot, confined, received equal quantities of maizemeal and unhulled peanuts; the second lot, peanuts alone; and the third lot (reduced to two pigs by the removal of an unthrifty one) continued to receive maizemeal only. The first lot gained 84 lb., equal to a gain of 1 lb. for every 3·7 lb. food consumed; the second lot increased by 59·5 lb., equal to a gain of 1 lb. for each 2·8 lb. of food; and the third one was, of course, not definitely decided. But as the result of other experiments with other leguminous crops and corn, Mr. Duggar was in a position to say: "When maize was fed alone it took nearly twice as much maize to make a pound of growth as when the pig had access to both corn and cowpeas or peanuts. The pigs on pasture had a better appetite, ate more corn, and made nearly three times as much growth as the pigs on an exclusive maize diet, and they made that gain at less cost per lb."

Under favourable conditions, an acre of peanuts harvested by young pigs produced pork to the value of nearly £4, estimated at 1½d. per lb. It can thus be seen that the peanut is well worth a place in pig-crop rotation; but it must be borne in mind that the results, not only of Mr. Duggar's experiments, but of other investigators in the States and Canada, demonstrate clearly the necessity of supplementing the peanuts with a cereal fodder. Pork from pigs fed entirely upon peanuts is inclined to be flabby, and it is characteristic of exclusive peanut feeding that the lard is scarcely ever firm even in the cold American winters. The softening effect of peanut feeding, when such has been unavoidable, might be partially corrected by feeding corn for one month previous to slaughtering.

Cowpeas.

Six young Essex hogs from the same litter, averaging 50·1 lb., were divided into two lots of three each. One lot for six weeks were depastured on cowpeas and given all the corn they wanted; the others were fed nothing but corn for the same period. The depastured lot gained 122 lb. for the 371 lb. corn eaten, equal to 3·07 lb. corn for 1 lb. gain; and the others gained 45·2 lb. for 263·8 lb. corn, equal to 5·86 lb. corn for 1 lb. gain. When the pigs were turned into the cowpeas the leaves were all green, and about half of the pods were still green. The pigs ate the green leaves and pods readily as long as they lasted, but during the latter three weeks only the seeds were eaten.

In the case of corn and cowpeas (half and half) and ground corn alone, the gain was much greater with the mixed ration. Where it took over 8 lb. of ground corn alone to make 1 lb. gain, the same result was achieved by less than 5⅓ lb. of corn mixed with cowpeas. No attempt appears to have been made to ascertain the effects of an exclusive cowpea diet. It is possible that pigs would do well enough on such food, but pulse alone is not a very palatable food, and the animals might soon become nauseated and not eat sufficient to become fat.

Not only did access to the cowpea crop prove a valuable addition to the corn fodder so far as mere increase of pounds of pork was concerned, but the combination did not injuriously affect the quality of the pork or the lard, which was firm, even, and sweet.

Mr. W. H. Wilson, of Norfolk, Virginia, speaking with an experience extending over twenty years of pig-farming on the paddock system, says that he is satisfied young pigs will take on fat faster on pea fodder than on corn. His plan in feeding is to sow peas in one paddock and soja beans in another. As soon as the peas are in pod the pigs are turned into them. When that crop is cleaned up the pigs are put in the soja bean paddock. By the time that crop is eaten the animals are in good condition for topping off. This is done by enclosing in a pen and feeding on corn for two weeks. The effect of the corn diet, following legumes, is to make the flesh firmer and the lard whiter and harder.

Sweet Potatoes.

Experiments to determine the value of sweet potatoes as a substitute for corn, in combination with cowpea pasture, showed the ration containing sweet potatoes to be decidedly inferior to that containing corn. This is supposed to be in part due to the fact that the pigs will not eat a sufficient quantity of a bulky food like sweet potatoes to obtain the same amount of dry matter as is furnished by the full ration of a more concentrated food like maizemeal. Sweet potatoes do not, however, appear to have any softening effect upon the bacon. They are so easy to grow in the coastal districts recommended for pig-farming, and produce such quantities of wholesome food, that they are worthy of a high place in pig-crop rotation.

Bran.

According to Professor C. W. Burkett, an American authority, bran is a poor food for pigs. For experiment, he divided twelve pigs, varying in weight from 45 to 50 lb., into four lots as evenly as possible. No. 1 lot received a ration of fermented or sour bran; No. 2, plain fresh bran; No. 3, stale bran and cornmeal; No. 4, cornmeal alone. The pigs were weighed each week throughout the experiment, which extended over ninety-nine days, when all the animals were put on cornmeal alone for a term of twenty-one days.

During the ninety-nine days the bran-fed lots did not increase much in weight. They took on fat and growth very slowly. The average daily gain for ninety-nine days was—for the fermented bran lot, ·61 lb.; fresh bran lot, ·70 lb.; bran and cornmeal lot, ·76 lb.; and for those receiving an exclusive diet of cornmeal, 1·08 lb. This was a decided gain in favour of cornmeal, and showed that such a food was better than bran, as well as indicating pretty clearly that the souring of bran had no good effect on its digestibility and feeding value.

During the term of twenty-one days, when cornmeal alone was fed to all the animals, it was found that the three pigs which had in the previous period been fed with fermented bran, with a daily gain of but ·61 lb., now increased at the rate of 1·44 lb. per diem. The lot which had received untreated bran increased from ·70 lb. gain daily to 1·24 lb. The corn and bran lot increased from ·76 lb. to ·88 lb. daily gain, while the cornmeal lot increased from 1·08 lb. to 1·38 lb. daily. As long as the bran was fed to the pigs their daily increase in weight was small. This was the case even when fed in combination with cornmeal.

Bran is considered to be too coarse, and to contain too much fibre or indigestible matter to be profitably and economically used for pigs. The supposition that souring or fermenting bran greatly increases its value does not stand the test in the above experiments. Worked out on a monetary-return basis, it was found that in the same expenditure for bran and cornmeal the latter produced just twice as much profit.

Pumpkins.

The value of pumpkins for all round purposes is every year receiving wider recognition. For standby feed it is harder to find anything easier to grow in abundance at little cost and which will keep sound for so long with the roughest of storage or treatment.

According to the *Texas Stockman* experiments carried on at some of the experiment stations with a view of ascertaining the value of pumpkins as a food for pigs show some very favourable results. At the Oregon Experiment Station six Berkshire pigs, 8 months old, were selected for an experiment, and fed fifty-six days on pumpkins and shorts. The total weight of the lot at the beginning of the experiment was 1,029 lb., and at the end 1,528 lb., and therefore made a gain of 499 lb. The total weight of pumpkins consumed during that period was 7,523 lb., and of the shorts 924 lb. Reckoning the pumpkins at 10s. per ton, and the shorts at £2 10s., the cost would be as follows :—Pumpkins, £1 15s. ; shorts, £1 5s.—or a total cost of £3. This makes the cost of food for 100 lb. gain live weight, about 11s., which is much cheaper than pork can be produced from grain rations when marketed at ordinary prices.

The profit in feeding pigs is not governed wholly by the cost per pound of gain during the fattening period. The growth up to this time may have been made at a much less cost, hence a little more can be profitably expended during the finishing period and not present a net loss. The pumpkin-fed meat was pronounced by experienced butchers the best they ever saw. The bacon was not over-fat and was firm in texture. The pigs were healthy throughout the experiment. They were not off their feed at any time during the feeding period. As to the difference in the value of cooked and uncooked pumpkins, experiments carried on at the New Hampshire Experiment Station indicate that the cooking of pumpkins does not increase their feeding value. At the same station it was also found that pumpkins prove an economical food when fed in connection with cornmeal.

Wheat.

It is contended by a correspondent of the *Leader*, Mr. R. Campbell, of Millicent, near Mount Gambier, that, given a fair price for pork or bacon, the most profitable way of disposing of cheap wheat is to turn it into pork, and, having had some experience, he submits particulars. It was found necessary, he explains, to purchase pigs for a start, and they were at once put into a 10-acre wire-netted plot and fed with wheat in the sheaf. As they grew large enough to fatten, they were drafted into the fattening pens, and topped off either with the whole grain or meal, the former being found by far the most economical, as, having no mill on the farm, it was necessary to cart the grain into the mill and back again.

Many, he says, have tried whole grain and voted it a failure, and rightly so from the manner in which it was tried. If only sufficient grain for a feed was given from time to time the pigs would bolt it, and the grain would certainly be wasted and the pigs not fatten. If when pigs were first put into the fattening pens sufficient mush was given to about gorge them, and they would eat no more, then fill up the trough with dry grain, and never let it become empty, a different result will follow. Keep another trough filled with clean water. As soon as each pig begins to feel hungry it will come to the wheat, chew it leisurely, and very little will be wasted. When several are penned together many will often be lying down while the others are feeding. The best kind of trough to use is about 15 inches wide, with a post at each end, carrying a 6-inch board, about 3 inches above the trough, battens being nailed across the trough about 9 inches apart. The board prevents the pigs from getting into or over the trough, and when they raise their heads to chew their noses are under the board, and any grain falling from their mouths goes back into the trough. After a while the wheat will generally get dirty through being nosed about; but if water is put into the trough, the pigs are enabled to get the grain without the dirt; but on no account allow the whole of the grain to be eaten up. Better take out the dirty grain and give it to the store pigs.

The pigs referred to, about thirty—from suckers to well-grown stores—were bought in the middle of February of last year. They were all well fattened and disposed of before the 7th September, without undue forcing. Against one test pen an account was kept of food eaten, which is as follows:—On the 1st August, eleven pigs, valued at 25s. each, up to the 4th September, disposed of eleven bags of wheat, valued at 9s. per bag. Cost of pigs, £14 15s.; value of wheat, £4 19s.; total, £19 14s. The pigs were sold alive in Adelaide, and netted £26 7s. 11d., or about £2 4s. 9d. each. Nine of these were half-bred Tamworths, and the other two nearly pure-bred Berkshire with a Tamworth cross. The latter realised 21s. less than the former. The pigs were the same age, and from the time they were weaned they had exactly the same treatment, being all fed together. Another pen, with a couple of weeks' extra feeding, netted £2 11s. 3d. each. They were all half-bred Tamworths from Berkshire sows. In addition to the price realised for the wheat, the bags were saved, and seven-eighths (estimated) of the manurial value of the grain was left on the farm.

Oats and Lucerne.

Mr. W. A. Henry, of the Wisconsin Experiment Station, in the *Breeders' Gazette*, in writing upon oats as a pig fodder, says: A pork producer who lives in a region where lucerne, corn, and oats can be grown, is to be congratulated upon the happy combination of good things. Increase the area of lucerne until there is abundance for the pigs, young and old. For very young pigs feed ground oats with the hulls sieved out. The hulls so removed, with more or less of the fragments attached, can, of course, be given to the cows, steers, or even the horses. Let the young pigs have a liberal allowance of sifted ground oats with some soaked corn and abundance of lucerne pasture. As they grow older more of the ground oats, hulls and all, together with soaked corn, may be fed.

When the fattening period arrives let the ration consist of at least two-thirds corn and one-third ground oats. Five hundred pounds of such mixture should produce a hundred pounds of gain, live weight. For breeding stock oats need not be ground, since only a moderate quantity is required for each animal, and it is well to sprinkle the grain thinly on dry ground, or a feeding-floor, so that they will spend plenty of time picking it up. They will also masticate them more thoroughly if they pick up the grains singly instead of getting them out of the feed-trough.

Lucerne is destined to become a factor of the greatest importance in pig-feeding operations wherever that wonderful plant will grow.

Dairy By-products.

The value of the by-products of the dairy for pig-food is so generally known that it is scarcely worth while saying anything about the subject. Still it is very interesting to go through the R.A.S. reports as to results of numerous official experiments and practical tests by individual feeders in a big bacon-producing country like Canada, to determine the respective merits of various dairy by-products for pigs.

There is practically no difference in the value of skim-milk, buttermilk, or whey, when all three are fed in fresh condition, except that, of course, the skim-milk will be richer or poorer according to the care taken to remove the butter-fat in the separator. Five pounds of skim-milk, per head, a day is an economical allowance in fattening swine, over one hundred pound in weight, when mixed grains are fed. Where maize was fed, as in Wisconsin, the best returns were secured with not more than three pounds of milk to each pound of maize-meal. Professor Robertson has found that one pound of mixed peas, barley, and rye is equivalent to 6·65 pounds of skim-milk. The protein and ash in the milk are what are needed to give strength to the bones and develop the muscles sufficiently. Professor Day, of the Guelph Experiment Station, has shown the marked influence of whey and skim-milk, not only in causing rapid and economical gains, but in producing a fine quality of bacon, even when no exercise is given to the fattening stock, and in counteracting the tendency to softness produced by the too lavish feeding of shorts. The average results of experiments at the Guelph and Wisconsin Stations show that 785 pounds of whey are equal to 100 pounds of grain.

Best methods of preparing Food.

It is generally agreed that where the whole grain is to be fed to pigs, the digestibility of it is increased by soaking. Cooking, except in the case of potatoes, is not considered either necessary or of real advantage in the preparation of pig food. Salt is of a great deal more importance than is generally believed, and a daily, but moderate, supply of it to fattening pigs will be of great assistance, inasmuch, as it renders the food more palatable and thus induces the animals to eat heartily. Wood ashes and charcoal are also to be recommended as a sort of pick-me-up for pigs that do not appear to be doing well.

SWEETENING THE LAND.

THE use of lime as a soil sweetener should be far more general than is the case, especially in some localities where the composition of the soil is naturally such as to create a sour tendency. The attempt to make lime appear as a fertiliser had a bad effect on its use, and many to-day refuse to use it at all. There are many cases where direct injury to the soil is being done through refraining from dressing the land with this soil sweetener occasionally. Lime is not a fertiliser in any sense of the word, and the farmer who applies it for that purpose will be disappointed; that is, he will be disappointed unless his soil happens to be full of organic matter in a state of congestion, which the lime will suddenly relieve. Many a farmer who has dressed his land with lime has concluded from this sort of experience that the lime added positive manurial ingredients to the soil. Instead of adding anything of actual benefit to the land, it merely loosened the imprisoned fertilising elements and gave the plants a chance to digest and assimilate them.

This is one of the great functions of lime, and it should be so understood. I have seen farmers spreading their fields regularly with a lime dressing in the belief that it would increase the fertility, but they did not realise that in time it would cease to have any good effect unless more organic material was added to the soil also. On the other hand, a prejudice against lime is apparent in localities where the land is sour, or so full of undigested organic matter that it is a difficult matter for the plants to find anything to feed on.

Our soils on heavy lands are very apt to get sour, and we must spread lime over them regularly to keep them in the highest productive condition. Heavy soils are rendered much lighter by an annual dressing of lime, and light sandy soils are sometimes benefited also. In the latter case the lime binds the fine particles more closely together and prevents fertilisers from leaching away so rapidly. Some soils do not seem to take much organic matter without getting congested and fermenting. Lime is the only remedy for such lands, and it should be applied as faithfully as the fertiliser or seed. A little more discretion and intelligence in the use of lime would make us all friends of this soil sweetener.—C. S. WESSELS, Illinois.

Production of English Bacon.

J. M. HARRIS,
British Dairy Farmers' Association.

THE large quantity of good-quality bacon sent into England from Denmark and Canada, omitting the enormous quantities of cheaper qualities imported from the United States, is astounding; and yet a large number of English farmers, with the best markets in the world at their very doors, and with every advantage in the matter of prices, neglect this industry. Why this is so, I cannot imagine, for, when carried out on business principles, it pays better than feeding any other class of stock, to say nothing of keeping up the quality of the land for the production of milk and other purposes. In the production of lean bacon the breed of pig used is, of course, a matter of prime importance. For some years past our own firm of bacon-curers have been trying to find the very best breed of pig for the class of bacon in greatest request. First, Tamworth pigs, both pure-bred and crossed with Berkshire, were tried. These carried a large quantity of lean, but they wanted a long time to fatten, and were often coarse and hard in the skin. The Berkshires were next tried. They were good, but very inclined to thickness in the shoulders, and, in coarse-bred ones, to thinness in the belly or streaky part (a very strong defect in a side of bacon). Therefore, neither of these attained the ideal aimed at. Thirdly, the large white Yorkshires were tried, and these, either pure or cross-bred with the Berkshires, are what the British bacon-curing trade requires, viz., pigs which feed well, mature quickly, are very prolific, are not thick in the shoulder, are thin in the skin, not too thick in the back, and which yield a side thick in the streaky or belly part.

To encourage the breeding of the best class of pigs for bacon production in the West of England, from which our firm draws nearly all its supplies, we are now supplying on advantageous terms pedigree pigs of the large white Yorkshire variety from the most noted breeders in the kingdom. In doing this we are only following the example of the large bacon-curers in Ireland, who have thus wonderfully improved the Irish pig. I may add that the Danish Government, knowing the importance of producing a first-class article, have assisted their farmers in obtaining pedigree boars and sows from England, and consequently they are now able to produce a pig fit for bacon at six months. A pig for profit should at 6 or 7 months of age weigh from 130 to 170 lb. dressed weight, this being the size that obtains the best price. If the feeder has a pig well bred, and feeds properly, he can easily bring him up to this weight within the stated time, and he should then be worth from £3 to £4.

In breeding it is most important to remember that pure breds only, and not crosses or mongrels, should be used, otherwise the farrows will not be so large, and the individual pigs will often be dwarfed; there will be two or three small ones in every farrow, and all the offspring will be thin in the belly or flank. Is there any other animal used for the food of man so prolific, so easily housed, fed with so little labour and at so small a cost, and which is worth so much at the same age?

About three years ago I conceived the idea of forming in Calne a committee of farmers and others interested in the pig and bacon trade, for the purpose of carrying out a series of demonstrations and experiments on the economical feeding of pigs for the production of lean bacon, the sort now in great demand. For the purpose of our experiments four stys were erected, and in their construction special attention was bestowed on ventilation and cleanliness, for it is a great fallacy to assume that pigs thrive well in filthy and unhealthy surroundings. Each of the stys accommodated ten pigs, and every experiment commences with forty pigs, fed as a rule on four different diets. The animals receive three meals per diem—as much as they can clean up each time. The dry food, meal, bran, &c., is soaked overnight in water, in the proportion of 1 peck of the former to 5 gallons of the latter, except when milk is used, when it replaces its own volume of water in the mixture. The potatoes were boiled and the mangolds sliced. Care should be taken not to make the food of pigs too sloppy. The milk in one experiment was often very stale, but subsequently it was obtained fresh on alternate days, and gave much better results. In spite of the results obtained in America and other experiments, there yet exists among some feeders a deeply-rooted opinion that stale milk is better than fresh. In order to demonstrate that this opinion is opposed to actual fact, it is hoped, in the near future, to carry out a series of experiments in which the relative values of stale and fresh milk may be determined, when fed with barley and maize meal respectively.

From our experiments we have obtained the following information. Referring to the suitability of the flesh obtained for the production of the best bacon, the following table gives the foods, in order of merit, commencing with the best. The best quality is taken as 1,000 points:—

		Maximum Points.
1.	Barley meal and bran	990
2.	Barley meal and separated milk	988
3.	Barley meal	974
4.	Barley meal, separated milk, and potatoes	967
5.	Maize meal and bran	964
6.	Maize meal and bean meal	951
7.	Maize meal and separated milk	945
8.	Maize meal	939
9.	Maize meal and pea meal	908

The comparatively low value assigned to pigs fed on maize meal and pea meal is due to a large proportion of the pigs so fed increasing very slowly, and being sold when too small to come within the scales shown above. The quality of those which did well—*i.e.*, gave a good increase—was about equal to those which had been fed on maize and bran. The addition of either bran meal or pea meal to maize gave far better results in cold than in hot weather, and both kinds of pulse varied very much in efficiency with different individual pigs. Some pigs did very poorly with these diets, whilst others did exceptionally well, so that special care is necessary in their use. A larger proportion of best pigs for bacon was obtained with barley than with maize feeding. The addition of either milk or bran, but especially the latter, to either barley or maize raised the best proportion of pigs.

The very important question of the relative cost of the various diets is one which is continually presenting itself, and the answer to which is as continually varying. For the purpose of conveying some sort of an idea of the relative cost of the diets used in our experiments in Calne, it may be expedient to base the calculations on prices assumed to be constant. The prices taken are :—Barley meal, £5; maize meal, £4 10s.; bran, £4; pea meal, £6 3s. 4d.; bean meal, £7 15s. per ton; separated milk, 1d. per gallon; and potatoes, 2s. per sack of 240 lb. On this assumption the cost of producing one score (20 lb.) dress weight was as follows :—

With	s.	d.
1. Maize meal and separated milk	4	2
2. Maize meal and bran	4	5¼
3. Maize meal	4	6¾
4. Barley meal, separated milk, and potatoes	4	7¼
5. Maize meal and pea meal...	4	7½
6. Maize meal and bean meal	4	11
7. Barley meal and bran	5	0¾
8. Barley meal..	5	1¾
9. Barley and separated milk	5	3

If the separated milk be estimated at 2d. per gallon, the cost of producing a score dressed weight with maize meal and separated milk becomes 5s. 4¾d., reducing that diet to the seventh place on the above list, and the cost of producing a similar amount with barley and milk becomes 6s. 7¼d. Assuming (*a*) the foods to be mixed in the proportion in which they were used in our experiments; (*b*) the value of a diet to be directly proportioned to the quantity and quality of the dressed increase produced; and (*c*) that the value of a food varies inversely as the time required to put on a given increased dressed weight during the period of fattening, the table shows the relative values of the nine diets referred to above. It should be distinctly understood that these values are perfectly independent of the varying prices of foods.

The maximum value (1,000) is assigned to that diet which, of all the twenty-four tried, gave the highest value. This diet, it may be said, consists of 1 gallon of separated milk and 3 lb. of potatoes per day, together with as much barley meal as the pigs can eat. The other diets are arranged in order of merit :—

		Points.
1.	Barley meal, separated milk, and potatoes	1,000
2.	Barley meal and separated milk	903
3.	Maize meal and separated milk	877
4.	Maize meal and bean meal	590
5.	Barley meal	519
6.	Maize meal and pea meal	486
7.	Maize meal	484
8.	Barley meal and bran	449
9.	Maize meal and bran	404

Briefly, then, to produce at the greatest profit the best pigs for the production of prime lean bacon, the farmer is recommended :—(*a*) To breed his pigs from Large Yorkshire Whites, or from these and pure Berkshires; never from crossbreds. (*b*) To house his fatting pigs in dry, warm, well-ventilated stys which allow of easy cleaning. They should be placed, if possible, in a sheltered and sunny position. (*c*) For fattening, to soak the meal used in cold water, to use barley meal as the staple food, and to supplement this, as far as possible, by fresh separated skim or butter milk, at the rate of about 1 gallon per pig per day, and, when procurable, by boiled potatoes also, not more than 3 or 4 lb. per pig per day. Where cheese is made it would be well to supplement the barley meal and whey by about 1 lb. of bean or pea meal per pig per day. Where dairying is not carried on, bran, toppings, bean or pea meal may be used with care as a substitute for milk; but the dairy farmer has undoubtedly a great advantage in the profitable production of the class of pig required for making the best-quality bacon.

MEDIUM-SIZED FARMS.

In his paper in the Year Book for 1900, issued by the U.S. Agricultural Department, Mr. Geo. K. Holmes, quoting statistics of agricultural development, draws attention to the increasing popularity in the United States of farms of medium area. In 1850, the average size of farms was 203 acres, and from that extent the average area decreased for forty years, until in 1890, the average was 137 acres. During the last ten years, however, it has been established by a thorough statistical analysis, that the increase in the number of holdings has more largely accrued to farms of medium size than to those of the smaller and the larger areas. Mr. Holmes does not feel justified in expressing any definite opinion as to why this state of things should be. He thinks the more general use of machinery must be reckoned as an important economic reason. The use of machinery is an important element in the development of agriculture all over the world, and possibly the medium-sized farm as it exists to-day is more susceptible of being more economically cultivated and managed than either smaller or larger farms.

Richmond River Soils.

By F. B GUTHRIE and C. R. BARKER.

The virgin soils from this neighbourhood possess certain rather striking features in common, and a sufficient number have been examined to render it possible to strike an average which shall fairly represent a soil typical of the area, which promises to become in the near future one of the principal dairying centres of the Colony.

The soils under discussion have been taken, for the most part, from the area on the northern side of the river, and are of volcanic origin, mostly overlying basalt, and derived therefrom.

From the analyses of a considerable number of virgin soils from this locality, we are able to give the following as the composition of an average soil. They are remarkably uniform in their chemical composition, and vary but little from the average here given :—

Composition of an average Soil of Volcanic Origin from Richmond River.

Capacity for water ... ... =	52	per cent.
Organic matter (humus) ... ... =	16	,,
Lime ... ... =	0·21	,,
Potash ... ... =	0·08	,,
Phosphoric acid ... ... =	0·30	,,
Nitrogen ... ... =	0·30	,,

Reaction --Neutral to acid.

The soils vary from light sandy loams to heavy loams, the heavy soils predominating. They are in nearly all cases well supplied with vegetable matter (humus).

Associated with this high humus-content (often over 20 per cent.) are a high percentage of nitrogen and a high capacity for absorbing and retaining water. This latter property is in the highest degree indicative of fertility, soils of this nature being open, readily worked, and favourable to the development of nitrification. The soils examined by Mr. Helms from this neighbourhood are all exceedingly active, and produce nitrates abundantly. They are also better able to resist dry spells than soils deficient in humus and with a low capacity for retaining water, as the surface evaporation is reduced to a minimum.

With regard to the mineral fertilising constituents, the soils under consideration are uniformly well supplied with phosphates, but poor in lime and potash ; and it is in the direction of supplying these ingredients that particular attention must be paid when manuring. The absence of lime, combined with the high proportion of vegetable matter, tends to the production of acidity in these soils, and of the samples examined a large proportion are sour in character.

General Treatment.

Where the subsoil is of an impervious nature, and the natural drainage inadequate, this defect can only be overcome by a proper system of drainage. In many instances, thorough cultivation and exposure of the upturned soil to air will probably effect a great improvement. But in all cases the soil should be limed.

Freshly-slacked lime should be added at the rate of about ½ ton to ¾ ton per acre; the treatment to be repeated every second or third year.

After the soil is thoroughly sweetened by this treatment, it will be in a condition to make the most of any manuring applied.

The manuring need not be very heavy, but the deficiency in potash in these soils must be specially kept in view.

Probably a good dressing of wood-ashes, if these are readily and cheaply available (about 20 to 30 bushels to the acre), would supply the requirements for pasture lands for some years.

Where it is intended to get the best results that the land is capable of returning, a somewhat heavier and more complete manuring is required. A mixture of the following composition (after liming) will probably give the best results for grass lands :—

1 cwt. sulphate of ammonia.
1½ cwt. superphosphate.
½ cwt. sulphate of potash.

per acre applied as a top-dressing.

Comparison with other Soils.

If these are compared with the soils from the Hawkesbury series, which occur in the neighbourhood of Sydney, we shall find that they belong, both physically and chemically, to an entirely different class of soils. The average humus-content of the Cumberland soils is about 7 per cent., or less than half that of the soils we are examining, and the retentive power for water is also very much lower. The Richmond River soils contain on the average more than twice the amount of nitrogen and phosphoric acid as is contained in the soils of county Cumberland, nearly twice the amount of lime, and about the same proportion of potash.*

Speaking generally, they are typically fertile soils, in good mechanical condition, and should provide good pasture, for which purpose they are eminently suitable. There should be no difficulty in raising good crops of every kind suited to the district.

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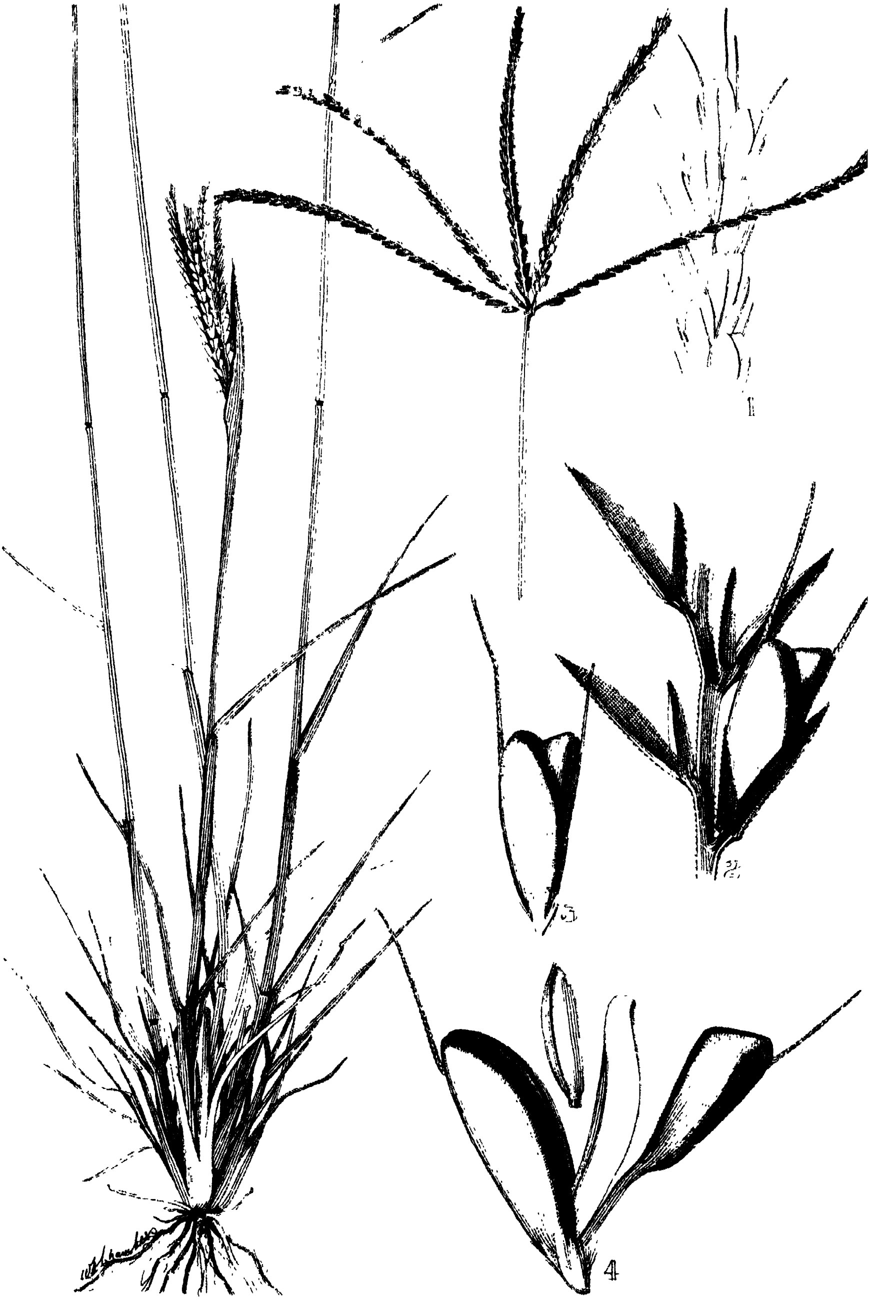
* Notes on the Soils of County Cumberland, *Agricultural Gazette*, May, 1898.



CHLORIS VENTRICOSA, R. Br.

Useful Australian Plants.

J. H. MAIDEN,

Government Botanist and Director Botanic Gardens, Sydney.

No. 67—*Chloris ventricosa*, R.Br.

Botanical Name—*Chloris*, the Greek word for "pale green," in allusion to the colour of some of the members of this family; *ventricosa*, Latin, meaning big-bellied, in allusion to the inflated spikelet.

Vernacular names.—"Blue star grass," "Tall star grass."

Botanical description (B. Fl. vii, 613) :—

> Often above 2 feet high, with few flat leaves.
>
> *Spikes*, five to seven in typical specimens, 3 to 4 inches long.
>
> *Spikelets* cuneate and obtuse, as in *C. truncata*, but larger, from 1½ to 2 inches long, and often, but not always, dark-coloured.
>
> *Flowering glume* broad, very obtuse, embracing the much smaller terminal one, which is raised and truncate, as in *C. truncata*, usually emarginate, the awns of both much shorter than the spikelet.

Another long-awned form has spikes of 3 to 4 inches. (Cabramatta and Ash Island, Hunter River.)

Value as a fodder.—A very good grass: palatable and nutritious, forming a compact turf. Reputed to be excellent grass for withstanding droughts.

Habitat and range.—Found in New South Wales and Queensland. In this Colony it occurs from the coast to the interior.

Reference to Plate.

1. Part of spike.
2. Part of spike, showing the spikelets.
3. Inner glumes of the spikelet.
4. Inner glumes of the spikelet, opened, showing the palea.

Manuring Wheat in Dry Country.

At the last annual Congress of the South Australian Agricultural Bureau, Mr. J. W. Dall initiated a discussion of vital importance to all wheat-growers in the arid districts of Australia—the use of manures.

Mr. Dall attended the Congress as representative of Nantawarra district, where the average rainfall for many years has been 14 inches, and during the last five seasons scarcely 8 inches a year. The first experiment with manures for wheat in that district was made three years ago, during a very dry season, by Messrs. Belling Bros., who are fairly large farmers. They tried wheat, side by side, with and without manure; and the experiment showed that the wheat manured with English superphosphate stood the dry weather a deal better than the unmanured wheat. The manure evidently forced the wheat along and got it past the very tender stage before the hot weather set in and hot winds could seriously damage it. Some growers had held the opinion that the use of manures in dry districts might spoil the crop. Mr. Dall's experience was that fertilisers might be used with safety in the driest country fit to cultivate.

Mr. A. F. Noll, representing Quorn district, submitted samples of wheat to show how beneficial manures proved in his district, although at present they did not receive much attention. The samples were grown on ordinary soil, and during the year the rainfall had been about 7½ inches. Manured and unmanured areas were sown, side by side, on the 1st of April. Some of the manured crops were 4 feet high, and the unmanured wheat was fully a foot shorter and had not developed nearly so well.

Mr. Priess had found that wheat sown with fertilisers comes up earlier than when not manured—this year it was two days earlier.

Mr. McNeil had fertilisers this season for the first time, and the plant was stronger than where no manure was used on the same kind of soil. It did not, however, seem to do as well on the red-clay soils as on sandy soil.

Mr. H. Aldenhoven (Woolundunga) had tried manures both on experimental plots and the ordinary cultivation paddock. In the paddock it did not seem to make much difference, which he attributed to the fact that the soil had been pretty well manured by the rabbits. He did not drill it, but sowed broadcast. In the experimental plots the only difference was that the manured portion was evenly covered, while there were bare places in the other.

Mr. G. E. Pattingale (Port Broughton) found that the manured wheat has done just about twice as well as the other, both on fallowed and unfallowed land, with a rainfall of about 10 inches.

Mr. E. H. Warren had heard it said that in dry country wheat will malt more readily when manured than when not manured. Was that the general experience?

Mr. McNeil sowed some about April 1st or 2nd. They had had a shower, and the ground was, he thought, moist enough to germinate the seed. It did not, but about three or four weeks later the crop came on with satisfactory results, and was now (September) a thoroughly good plant.

Most speakers seem to agree that the manures will not injure the wheat in the dry country, said Mr. D. F. Kennedy; but a more important question is, if you can profitably use fertilisers with an 8-inch rainfall. He tried it, near Kadina, putting in 10 tons of manure, costing £54, and after saving enough seed for the same ground, all he got was £23 worth of wheat; so he contended it did not pay. English superphosphate was used.

The General Secretary (Mr. A. Molineux): It is there for next year.

Mr. Kennedy did not think so, because he had the land in this year, and the manure had no effect on the crop. Some was sown on fallow; some on stubble. The fallow gave the best result. It will not pay with an 8-inch rainfall to use fertilisers. Perhaps, if the whole 8 inches fell after the seed and manure were in the ground, it might; but of that 8 inches only about 5 inches were of any value to the wheat crop.

Mr. Dall said the quantity of manure used to the acre was from 70 lb. to 80 lb.; but it was said that benefit is derived from the use of 35 lb.

Mr. Noll used about 80 lb. to the acre.

Mr. R. Marshall read a paper on "Preparation of the soil for the reception of the seed." His remarks were confined to his own experience in a district where the average annual rainfall is barely 15 inches, and with fallow land. Concerning the application of superphosphate to wheat, he said: "In regard to the application of English superphosphate, I am prepared to find my opinions run counter to many practical farmers and others who frequently—I might say always—hold up the use of the seed-drill as the sole means of obtaining such excellent results, because of placing the seed and manure in contact with each other in the soil. At the same time, I am fully convinced from my own practice, equally good results can be obtained by applying superphosphate to the soil any time between seed-time and harvest, either with the seed drill, or any other means of covering it under at a reasonable depth. The manure is thus placed in the soil when the land works light, seeding is greatly facilitated by allowing the extra horse strength—that would be required for working the drills—used on other necessary implements, for getting in the seed with the use of the broadcast seed sower will generally allow seeding to be completed during the early part of the season (May). That any compensating advantages gained by the use of the drill in placing the seed and manure together, if any, are more than compensated by saving of time and labour under the broadcast system.

The good results gained by the use of the seed and fertiliser drills are due almost, if not entirely, to the fertilisers, quite independent of the seed drill. In this connection, I think the seed drill altogether too expensive and elaborate for the distribution of fertilisers only. That a simple and comparatively inexpensive arrangement can and will be invented to work on the scarifier, driven by sprockets from the scarifier wheels, I am sure. Such an implement would give the additional advantage of moving all the land when distributing the manure; or the seed and manure could be placed in the ground at one operation with little if any disadvantage compared to the use of the seed drill. In this connection, I will name a friend of mine, Mr. James Arnold, of Roseworthy, who always broadcasts his English superphosphates, and has never used a seed drill. Yet his crops are, as a rule, quite equal to anything grown in that district, and vastly superior to the average of the district. Although I am possessed of two 13-coulter seed drills we seldom use either for drilling in the seed and manure together. And when they are used for that purpose the coulters are usually cast off the seed and manure sown on the surface, and covered with the scarifier following after the drill. My results from this method of applying the seed and manure together, I think, have been quite equal to the ordinary method of drilling seed and manure together. This system has several advantages. The seed is put in much quicker and with less labour than is the case with the seed and fertiliser drill. A little rain will stop the work with the drill for several days, but under the other system the work can be got on with directly the weather breaks. Seeding need not be commenced till the soil is in good condition, and can be finished in reasonable time. The land I have been farming consists of all classes, from light sand to heavy, and Bay of Biscay ground. Under the system outlined, this year we finished seeding over 800 acres in less than four weeks, using two 15 and one 19 tine scarifiers, followed by a team harrowing. The strength of horses was 32; of course, they are well fed and kept in good condition. I fully expect the hints I have thrown out will be severely criticised, because they run counter to accepted and conceived notions, but I hope will not be condemned without trial, especially by those not yet possessed of a seed drill. If my theory is proved wrong in practice, no one will be more pleased than myself to be shown I have been travelling on the wrong track.

On the subject of manures generally, Mr. Marshall considers that the use of fertilisers has become absolutely necessary to profitable farming. Where bone-dust is used, he had no hesitation in saying that the best results would be obtained if applied to the soil and fallowed under early in the season; the resulting crop would derive much more benefit than if applied at seeding time, because of its being in a more available condition. The same applied to all slow-acting fertilisers.

During the discussion of Mr. Marshall's paper, it was mentioned by Mr. J. Brown, of Port Elliott, that in the southern portion of South Australia it was not advisable to put in the manure beforehand, as there was always a certain amount of grass and oat seeds in the land. Ploughing could not commence before 1st May, and thus seeding time was limited. Drilling the manure in with the seed was the only practicable method in his district. In the south, with smaller areas of land, and no room to extend, it paid better to grow a crop of peas on wheat land than to fallow. They got nitrogen from the peas, as well as the crop itself, besides keeping the land clear for the wheat.

Mr. MARSHALL, in reply to criticisms of his paper said: "I simply dealt with my own practice in the North. If I were farming in the South I do not think I should fallow either, because a crop of peas would probably benefit the soil more than the fallow would, on account of the nitrogen they would supply. Besides, there is the profit from the crop. That circumstance would hardly apply to the North, where we have to store up all the moisture we can for the drier seasons. One gentleman said he found the benefit of English superphosphate disappeared in one year; my experience is quite contrary to that. Where we have, for experiment, missed strips with the manure we have found a great difference in the grass in the following year. There has been just as much difference as in the wheat crop. The growth of grass on the manured part was twice as much as where we missed, and the stock seemed to do much better where we used it. I have noticed the same thing on my neighbour's land. The question has arisen, as to how best to place our crops in the ground. Where we place manure in the soil it is all scarified in and harrowed. One gentleman said that by concentrating the manures in the drills with the wheat the crop got a start on the oats. Personally, I try not to grow oats at all; but for dirty land there may be something in the argument. I have found no advantage in drilling seed and manure together, and my sons have given up the idea almost altogether. The crop this year looks well. Last year the drilled wheat was no better than the broadcast on land previously manured, and three years ago the drilled wheat was considerably the worse."

So far as the experience of the Department, and of a number of wheat farmers in the western and south-western districts of this Colony go, the use of a moderate quantity of readily soluble fertiliser like superphosphate has a wonderfully stimulating effect upon wheat crops when there is rain in sufficient quantity at the time of sowing or very shortly afterwards. It will be probably found that, in addition to deepening the soil, so as to provide for better conservation of moisture to tide the crop over dry stages, three or four shillings' worth of commercial fertiliser per acre will be a remunerative investment. But the areas sown to wheat in dry districts are generally so extensive that the outlay of even a few shillings per acre for fertilisers is a grave undertaking. The carefully planned comparative tests of fertilisers of all kinds and in varying quantities that the chemist to this Department, Mr. F. B. Guthrie, is carrying out at Wagga, Bathurst, and Coolabah Experiment Farms this season should go a long way towards setting at rest many doubtful points as to the commercial practicability of manuring large tracts of wheat land. So far the season promises to be one that will put the various formulæ to a sufficiently severe test.

On the Culture of Blue Lupins.

THE following report of experiments conducted in Europe to determine the value of blue lupins for green manuring is translated from the *Journal de l'Agriculture*, France, and will probably be found of interest to farmers and orchardists who contemplate sowing this crop to turn under.

The successful culture of blue lupins is even more uncertain than that of the white-flowered species. It is rare anywhere but in silicious soil.

They are supposed to be calcifuge, and experiments on these plants were the more interesting that they have recently been made the objects of research, principally by M. Stoklasa, of Prague.

The first culture of blue lupins in 1897, in silicate soil alone, or mixed with different percentages of chalky soil, failed completely, notwithstanding that these artificial soils had received large portions of mineral manure. The successive spreading or mingling of a soil bearing lucerne, or nitrates procured direct from Germany, did not produce nodules on the roots, and it appears to me that we may conclude from this failure that the blue lupin is altogether incapacitated from assimilating directly and without special aid, atmospheric nitrogen.

In 1898, the cultivation was at first carried on in a plain soil, in an ancient market garden which contained some chalk. Most of the seeds were abortive; however, in one spot, four or five stalks grew all right, flowered and produced pods. On taking them up, no nodules were found on the roots.

The same circumstances applied to their cultivation in a sand bed; there most of the plants disappeared, leaving only a small number, which flowered and bore fruit, without the roots being covered with nodules.

No better result was obtained from lupins grown in pots of sand, with mineral manure and moist matter added, notwithstanding that these plants were inoculated with lucerne bacteria, according to M. Breal's method.

Strong plants were, however, obtained in vases which contained only mineral manure without moistening material. Each vase, however, only held a single plant, the other seeds sown being failures.

From one of these vases, a stalk weighed, after desiccation, 3 2 grammes; from the other, a very vigorous plant weighed 8 grammes, this latter containing 93 milligrammes of nitrogen, or ten times more than is contained in one seed.

Neither of these plants had nodules on the roots. The radicle tubercles only appeared on one of the plants which had not been inoculated, but it was not much stronger than the others which had none. How these strong plants which lacked nodules on the roots could have absorbed nitrogen from the atmosphere is exactly what is so important to find out.

At first sight, the pots of sand did not appear to produce any cryptogamic vegetation, but on scratching the surface, there were discovered, at a slight depth, numerous green algae (mosses), and we know, from the works of Messrs. Schloesing and Laurent, Beyerinck, Stoklasa, and still more recent ones of Bouilhac, that these algae, in conjunction with certain bacteria, absorb the nitrogen in the air.

If this really is the origin of the nitrogen in the lupins, we ought to find more nitrogen in the upper layers of the sand where the cryptogamic vegetation appears than at the bottom of the vase where no such growth exists. So it is, that 100 grammes of dry sand at top of the vase were found to contain 80 milligrammes of nitrogen, whilst only 4 milligrammes were found in the same from the bottom.

It thus seems probable that the action of the bacteria in destroying the carbonic matter produced by the mosses, which absorb the atmospheric nitrogen, formed an organic matter utilised subsequently by the lupins, and we can the more readily admit this conclusion, as it is supported by the discoveries of M. Berthelot, of which we only cite one case in particular. However, it will be very interesting to see next season if these bacteria and algae are found again under the same conditions. They were not found during the first series of experiments in 1899, and only very weakly plants were obtained in the sand, although it was covered with various algae. The upper part of the sand only contained from 15 to 20 milligrammes of nitrogen per 100 grammes. However, during a second series of cultures in the summer, there was obtained from a vase, to which mineral fertilisers and humate of potash had been added, four plants weighing on an average, after desiccation, 2·4 grammes, and containing 2·03 nitrogen per 100 of dry material—that is, 48 milligrams of nitrogen per foot, or six times more than is contained in a seed.

These plants bore no nodules on the roots. M. Bornet, of the Academy of Sciences, was good enough to examine the algae which occupied the sand, and found the *Phormium automnale* and the *Ulothrix flaccida* in almost equal proportions.

The observations of 1898 were, therefore, confirmed, namely, that the blue lupins were utilising for their own benefit the nitrogen formed by the combination of algae and bacteria by a process remarked upon by M. Stoklasa in his memoirs, to which we have already alluded. The utilisation of this organic matter seems to be made direct, as the nitrates have never been discovered in the sand.

Again, in 1899, we noticed that, among lupins which bore nodules on the roots, many were but feeble specimens, while others, again, profited greatly by the work of the bacteria; yet we have not been able to find out any very distinct difference in the aspect of the nodules, which sometimes consist of parasites, and sometimes, on the contrary, form a part of the plants.

We are informed that, during the year 1899, the blue lupin prospered in the garden of the Vegetable Chemical Station at Meudon, and M. Berthelot sent us some vigorous plants, the roots of which bore nodules, and gave us also a quantity of the mould in which they were grown. An examination of the soil revealed a very unexpected fact—it gave a distinctly alkalic reaction; and in submitting 100 grammes of it to a careful washing we obtained 160 milligrams of carbonate of potash. Yet the blue lupin has been generally considered a plant of acid soil, and the bacteria which produced the nodules on its roots as only existing in soil of that nature. It was important to find out if this opinion was incorrect, as the plants from Meudon seemed to show. We, therefore, set plants, not only in the soil from Meudon, but also in pots filled with heathery soil (with distinct acid reaction); also, in the same soil with added mineral fertilisers; and, finally, in heathery soil made alkaline by the addition of a sufficient quantity of carbonate of potash. The lupins which were sown rather late in the soil from Meudon bore nodules on their roots, and so also did those which were grown in the acid heathery soil, and they were similar to those which appeared spontaneously on a few of the plants sown in sand.

The lupins in the heathery soil only reached a very moderate development. They weighed 1·450 gramme each in the dry state, and there was 2·35 of nitrogen per 100 of dry matter.

By adding mineral manures to the heathery soil we obtained much stronger plants, these weighing after desiccation 1·940 gramme per foot from one of the pots, and 2·380 grammes from the other, the radicle tubercles being numerous.

Finally, by the addition of mineral manure to the heathery soil, as well as a quantity of carbonate of potash to make it distinctly alkaline, we obtained plants weighing, when dried, 2·060 grammes from one pot, and 2·066 grammes from the other. Both plants, the roots of which were covered with nodules, contained 2·8 nitrogen per 100 of dry matter, which is equal to 61 milligrammes per foot. We must, therefore, come to the conclusion that the bacteria in the nodules attach themselves to the blue lupins just as well in an alkaline soil as in an acid one. Finally, the following are the conclusions drawn from numerous experiments made during the last three years:—

1. That blue lupins are incapable of absorbing the atmospheric nitrogen by themselves without outside aid.
2. They can obtain a normal development without having nodules on their roots, in which case they seem to profit by the work executed by bacteria on certain algae; but this effective association, which was frequently found in 1898, was much rarer in 1899, and we have very often found, in the pots of sand, algae which have not appeared to be of any benefit at all to the lupins which grew there.
3. That the roots of the blue lupins often carry nodules containing bacteria which do not work to the profit of the plant, but which seem to live in those nodules more as parasites than as associates.
4. But that in other cases the roots bore tubercles full of bacteria, which worked for the good of the plant. We have remarked on the efficacy of those which existed in the soil from the Meudon Establishment, which was distinctly alkaline.

5. It appears that the germs of these bacteria are very rare in arable soil, hence the frequent failures in cultivating the blue lupin. On the contrary they are plentiful in heathery soils, and the nodules appearing on the roots of lupins grown in these show that they have retained their acid reaction, or that they have been made artificially alkaline.

If the regular failure of blue lupins in ordinary arable soils is due to the absence of effective bacteria, we can no doubt render these soils suitable for this culture by introducing the bacteria, and that is what we intend to try during next season.

POISONING SPARROWS.

MR. W. Carroll, of Evans' Plains, Bathurst, brings under notice, for the benefit of *Gazette* readers, the following method, which he has found to be very successful for the destruction of sparrows :—

" Make a large hen-coop divided into two compartments, one being much larger than the other. The coop can be well and cheaply made by constructing a skeleton framework and covering it with coarse wire-netting, through which a sparrow can easily enter. Now set the coop in a conspicuous place frequented by sparrows. Enclose a fowl in the small end of the coop, and proceed to feed and water this bird carefully, scattering some wheat at the same time into the other compartment, also some outside to attract other fowls. In a few days the sparrows will begin to investigate, but should not, apparently, be noticed. In a short time they will be quite at home, coming to feed regularly. Then mix a little sugar and water with the wheat, afterwards adding some vinegar and sugar. When the sparrows take this readily, add strychnine. Procure a shilling's worth of the poison, which should be dissolved, and some vinegar and plenty of sugar added. Fill two ordinary pale-brandy bottles nearly full with dry wheat; pour half the poison mixture into each ; fill up with warm water and shake well. Let the bottles stand for twelve hours. Then drain off the liquid, and break the bottles over a large sheet of paper ; otherwise, it is difficult to extract the wheat, which is afterwards placed in the sun for a few hours to dry. A small quantity is sprinkled in the unoccupied section of the coop when the fowl is getting its usual allowance of wheat. It is very deadly, one or two treated grains killing a sparrow. Always promptly remove the dead birds from about the coop. Cats will receive no injury from eating the bodies of birds poisoned in this way. All vessels used in mixing or handling the strychnine should be destroyed at once to prevent accidents "

Horses for Export.

W. H. CLARKE.

THE horse question has been discussed pretty well from every point of view during the last twelve months. At present, scarcely a week goes by without the despatch from the Colony of hundreds of the likeliest animals that can be purchased, and, if the traffic continues much longer, strenuous efforts will have to be made to breed up to local requirements, let alone export.

Apart altogether from present commercial advantages the Colony is reaping from this wholesale equine exodus, there is likely to arise out of the business a new set of conditions upon which substantial and permanent improvement of Colonial horse-stock may be based. The great thing is to find out what are really the most profitable horses to breed for the markets that are being opened up. The fact that horses are leaving these shores in thousands is a matter for great satisfaction; but the prices they command, compared with what is written about the ruling rates for horseflesh in other extensive breeding countries, are a bit disappointing. It was thought that from the South African campaign some data might have been forthcoming as to the comparative utility and stamina generally of animals from the different quarters of the globe drawn upon for remounts; but apart from scant and not altogether conclusive details about a few individual horses, we have not learned a great deal beyond the grim fact that modern warfare is the very deuce on horseflesh all the way round. Nevertheless, it is clear that alongside the best equine blood and muscle the world could show, the best of their class of Walers have held their own, and with that New South Wales breeders may rest satisfied that, so far as mere stamina goes, the lines that have been followed here in the past by the enthusiasts were the right ones. What appears to be necessary, however, is to breed a different sort of frame—perhaps a bulkier one—in which to set the stamina; for it cannot be denied that the trend of inquiry nowadays is for as much horse as possible for the money.

From a commercial standpoint the day of the little horse, wiry as a birdcage, has passed. The big well set-up animal, with plenty of bone and style, is the one that seems to fetch the longest price, and he is just the sort of horse that will most readily fit into the conditions that are now ripening apace in this Colony. Even five years ago it would have seemed a bit out of the way to suggest that there would be room in our horse trade for farmers to return to the old system of keeping first-class mares from which to breed a few foals annually. Nowadays, with so many buyers in the field, it will not only be possible but extremely profitable for farmers to do this. Of course the idea is as old as the hills. It has been in vogue for decades in Great Britain and on the Continent; but it is really only recently that the breeding of horses "in bulk" for special purposes over a wide range of farms has been brought within the sphere of systematic endeavour.

It was thought, when efforts were being made in the German Empire to nationalise horse-breeding, that the interests of agriculture and the wishes of the Army authorities would not harmonise; but they did. Where trouble did arise was in cases where attempts were made to breed a particular class of horses in country and under conditions naturally unsuitable for them. By degrees, however, the business settled down into natural grooves, and not only are the enormous and exacting requirements of the Military Forces met, but there is always a plentiful supply of rejects—often for causes quite trivial—that are available for agricultural purposes. That German buyers came to this Colony for horses for the East is most probably a question of transport, also due to the solid fact that Australia is one of the world's ordained horse bazaars.

"It took years of every variety of effort on the part of the German Government to get the production of the right stamp of horses in sufficient number in going order. The best stallions procurable for the purpose were obtained, instructions by means of printed matter and lectures were given, colt-raising establishments were located in various districts, and a system of mare-and-sire inspection was inaugurated. The military people, on their part, responded to the wishes made known by the farmers, and arranged market places for the sale of horses, so that breeders might submit and dispose of their stock with least inconvenience." According to official reports, the work done in Germany, from the breeder's point of view, has shown that the foundation of a rational breeding is the selection of good animals for the mothers. Lest this should be left to chance, or any farmer not be able to procure on his own account the proper material, the authorities have established at Kalkreuth a supply depôt where *bona fide* breeders may obtain suitable mares at net cost; but it is left to the breeder's own exertions to maintain the high standard of general utility at which the national system aims. The farmer horse-breeder must be clear as to what type of horses he should raise for use in his own operations. The nature of his soil, to a great extent, will govern his personal requirements, and he is encouraged all the time to have regard to the use to which a horse may be applied in case it cannot be sold at a fair profit. No matter what the precautions are to mate the best with the best, every horse-breeder in New South Wales and elsewhere knows that the production of actually profitable horses represents but a small percentage. In Germany the percentage is not stated, but from official reports it appears to be satisfactory; at any rate, horses with hereditary defects—bandy legs, cow-hocks, knock knees, weak backs, bad connecting lines—are not used for stud purposes, and many of the evils that are perpetuated where indiscriminate mating is customary are thus avoided.

Among the conditions under which brood mares are obtained at Kalkreuth Depôt, it is stipulated that the dams are to be annually exhibited for six years by the Military Supply Commission at the nearest supply depôt, or at the central depôt, and that they shall be accompanied by their foal of the last year. Should the mare fail to have a foal in any year, the foal of the previous year is brought.

The mares are subject to periodical official inspection, and provisions adopted with the object of maintaining the constitutional soundness must be complied with. The purchaser of these mares has further to enter into an undertaking in respect to mating, and special permission has to be obtained to use any stallions but those approved by the stud authorities. Under certain conditions, such as sterility or injury, the mares can be disposed of, but the re-sale of dams capable of producing desirable offspring is not encouraged.

The National Stud Farm of Hungary is about the largest institution of its kind in the world, comprising thirty-eight distinct establishments, and extending over an area of 60 square miles. The stud was established by the Government in 1785, since when the stud-book has been kept with the utmost exactitude. The original stock embraced a miscellaneous collection of Polish, Bessarabian, Spanish, Norman, and Arab horses. It now consists of three breeds called Gildrans, Nonius, and English half-breed. The first-named breed derived its descent from an Arab stallion named Gildran, introduced in 1818, whose offspring were crossed with English thoroughbreds; and the present Anglo-Arab breed thus obtained is viewed with much favour, being strong, boney, 16·2 high, and well suited for saddle or carriage, or as light-weight hunters.

The Nonius breed is so called after a horse of that name introduced from France in 1815, whose descendants have been crossed with Hungarian and English mares. The Nonius horses are dark bay, from 16·2 to 17·3.

Among the English half-bred horses are many on whose stable-door records are to be observed the names of progenitors famous in English racing annals.

When Mr. Mulhall, from whose report the details were obtained, visited Hungary in 1896, there were 3,400 in this national stud.

In Austria there are national stallion depôts, costing £120,000 per annum, besides a yearly appropriation of £40,000 for the importation of thoroughbred horses from foreign countries. About 1,100 horses of English, Norman, Arabian, and crossed blood are maintained.

Mr. M. de C. Findlay, of H.M. Embassy at Vienna, submitted to the Royal Commission on Horse-breeding, in Ireland, a very full account of the administrative steps taken in Austria-Hungary to maintain the standards of horses. Although the general management of the national studs is entrusted to a military department, everything connected with the breeding establishments comes under the Ministry of Agriculture. Besides the big studs and stallion depôts, there are located throughout the country hundreds of "covering stations," at which stallions suited to the requirements of the district are placed at the disposal of the local farmers and private breeders. The fees charged for the use of the stallions range from 1s. 8d. to 16s. 8d. per mare; but in some districts, where the breeding of horses is a need of especial encouragement, the services of State stallions are provided free. A revenue amounting to nearly £30,000 per annum is derived from covering fees.

"Private owners are encouraged to keep stallions for their own use and for hire to others, as by this means it is hoped that horse-breeding will be emancipated from State assistance." To prevent the use of unsound or undesirable stallions, provision is made for veterinary inspection, and the issue of a license at the cost of the State. The use of an unlicensed stallion (except for the owner's own mares) is a punishable offence. Licensed animals are periodically examined by an official veterinary surgeon. The fee charged by private owners is a matter of arrangement between the parties interested. When a licensed stallion, especially a heavy horse, is found especially desirable for stud purposes, the owner is encouraged to keep him in the district by a State subvention.

A great many of the stallions used in the national studs are purchased from private breeders, and frequently stallions are sold at an extremely moderate price and easy terms to communities. Every facility for the transport of brood mares and sires is granted by the State railway authorities.

In Switzerland, £25,000 a year is spent in the improvement of cattle and horses. The method followed is: Any individual may import stallions or bulls from foreign countries by paying 30 per cent. of the price, the Swiss Federal Government contributing 50 per cent., and the authorities of the Canton to be benefited, 20 per cent. Annual grants are also given for foals of approved classes.

In France, the Government maintains twenty-two state studs, or depôts, for stallions for the purpose of keeping up the supply of remounts for the Army, and of maintaining a sound breed of horses in the country generally. These establishments cost something like £290,000 per annum for equipment and working expenses. There is also a National School of Studs.

Everything possible is done to encourage private individuals to keep approved stallions, and £60,000 a year is awarded in premiums for stallions and brood mares belonging to private individuals or associations or other co-operative bodies, and approved by the Department of Studs. Most of the money is distributed at local horse shows and it is generally supplemented by voluntary contributions. The trials of horses are of a comprehensive nature, and are based upon the sort of work each particular class of horse is likely to be called upon to do. The French people appear to have got at the undesirable stallion pretty effectually by the enactment of legislation whereby no owner of a stallion is at liberty to use him for any mares other than his own until he has received a certificate from a properly representative tribunal of experts who will examine the animal and certify if he is sound. This certificate is issued free, and renewed yearly, the owner of the stallion being bound under the Act to produce it whenever asked by those who come to him with mares. The approved stallion, to prevent misrepresentation, is marked under the mane, and if the certificate of soundness has to be withdrawn, to this mark is added a letter signifying rejection.

Olives.

(Continued from p. 836.)

W. J. ALLEN.

Soils.

One of the old, and in many instances mistaken, ideas was that olive-trees would grow and do well on soils which were too poor for other fruit-trees; this, however, was long ago proved to be a fallacy, as the olive is found doing its best on good soils, such as most other trees would thrive in. This tree will do exceptionally well in those lands which are rich in lime and soda, such as we find in the mallee portions of the Colony. I would, therefore, recommend the intending planter to choose, where possible, only good, friable soils on which to establish his olive orchard, and to avoid planting on lands where other fruits have been found not to make satisfactory progress (except, as above-mentioned, in soils rich in lime and soda), or in badly-drained, heavy, clay soils.

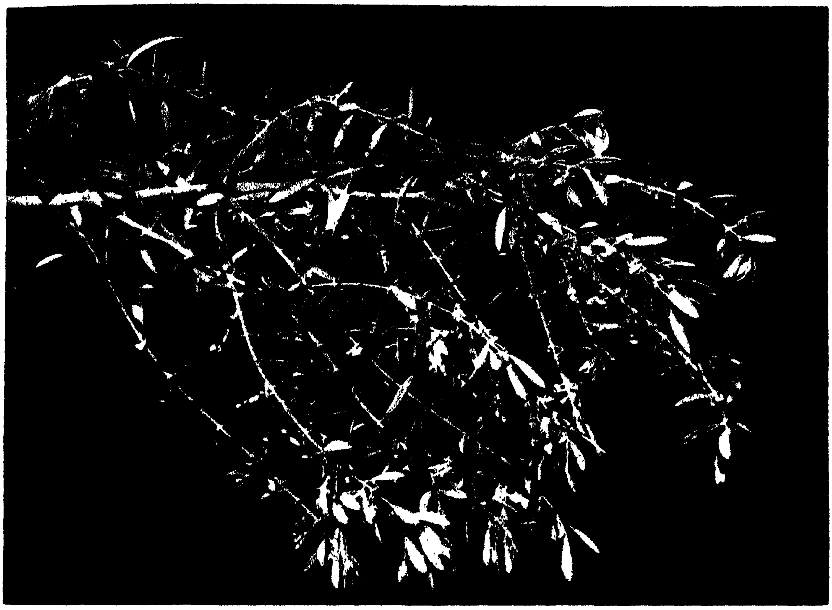
This Colony has, I consider, thousands of acres of the very best soil suitable for olive-growing, but the greater portion of it would require to be irrigated from twice to three times during our long dry summers, as most of these lands are found in the interior and warm districts. There are some few places where with good cultivation the olive will grow without irrigation, and at present there are olive-trees growing and doing very well at Wagga, Albury, Corowa, Dubbo, Moree, and other districts with similar climates, where the soil is loamy and has a fairly good natural drainage.

Transplanting.

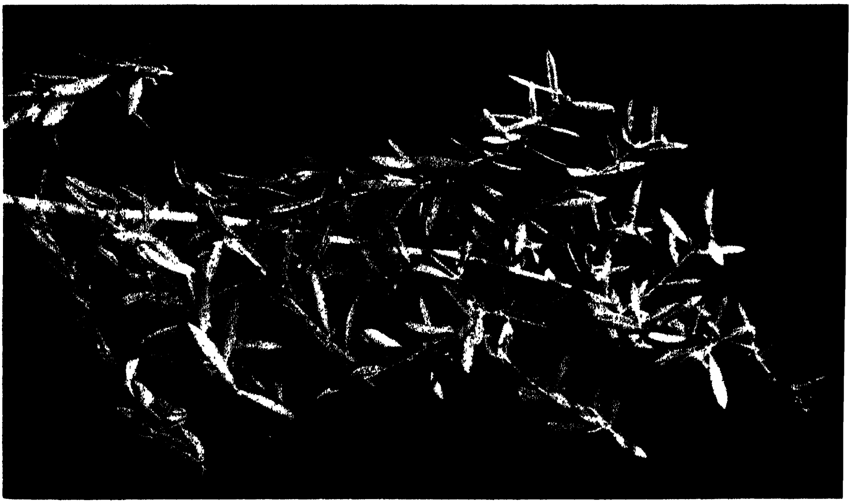
It is best to transplant the young olive tree during July or August, while it is quite dormant. The top should be well headed back and all lateral branches shortened in. The same care should be exercised in transplanting these as the orange—that is, the roots should never be exposed to the sun or wind, and all broken and damaged roots cut away. If the soil is at all dry at time of planting see that it is well settled around the roots by the application of water.

It is a very ordinary occurrence for the olive to lose all its leaves at the time of transplanting, and remain thus for some time before throwing out any leaves, but so long as the bark remains green the tree will start all right. See that the soil around the tree is kept loose by the frequent use of the fork-hoe.

On the poorest soil trees should never be planted nearer than 22 feet apart, and up to 30 feet on good soils.



Before Pruning.



Pruned.

Preparation and Cultivation of Soil.

Before planting out the orchard the land should be thoroughly prepared by subsoiling to a depth of 20 inches at least, and the whole ground brought to a fine tilth, such as will enable the young rootlets every favourable opportunity for extension, so that when the young tree is planted it will make a good start, which is very essential. When once the orchard has been planted it should receive proper cultivation, with likewise due attention to the application of suitable fertilisers.

The orchard should receive an annual ploughing in the winter, after which the land should be kept thoroughly stirred with a cultivator, so as to keep the soil loose and assist in retaining as much moisture as possible. No weeds should be allowed to grow in spring, summer, or early fall, as they sap the soil of its moisture.

In districts where irrigation is practised the trees should receive an occasional irrigation, so that, with constant and thorough cultivation, the tree will grow well and produce good crops. The supply of water, however, should not be too liberal, else the effect will be more disastrous than beneficial, as it is impossible to make a profuse supply of water take the place of proper cultivation, as many novices have found to their cost.

Pruning.

This important branch of work has been very much neglected in many districts where olives have been planted, as the growers are of opinion that this tree does not require pruning. If the olive receives regular annual pruning, either light or otherwise, according to the growth which the tree has made, it will be found that the trees will crop more regularly than where they are left to their own sweet will, when they usually crop every other year.

The trees should be pruned every year, but it will be found that some varieties require the knife more than others. This work is best done as soon as the crop is disposed of, or not later than the 1st of August.

Our object in pruning should be to keep the tree just so open that it can develop fruiting wood all through the tree, as well as to keep it from growing too high, as the lower we have the tree the more easily the fruit is picked. Therefore, from the time the tree has attained the height of 4 or 5 feet, the pruning should commence with this object in view, viz., to keep it as low as possible without too many main branches, and with the fruiting wood distributed evenly through the tree. The olive bears its fruit on wood of the previous year's growth; the problem, therefore, for the pruner is to regulate the number and kind of branches on the tree that only a sufficient number of wood branches are left to shape the tree, and to subsequently furnish a place for fruit branches. It is found that the vertical branches are practically sterile, while the horizontal branches bear the fruit.

No hard and fast rule can be laid down for each tree or kind, as one tree may require to be severely cut, while another may only require a little pinching back. If a tree is too thick in the centre, no fruit will set inside—in fact, no fruit will set where the sun and light (which are the principal agents of fructification) cannot penetrate freely.

I would recommend the vase or goblet shape for those who are growing olives, as by this system scale diseases are more easily kept in check and the fruit ripens more evenly and earlier. The lower and drooping branches may be allowed to grow downward until they almost touch the ground, as these shelter the friendly ladybirds, and act as a protection for them as well as producing good fruit which is easily harvested.

The Nevadillo Blanco is a sturdy low-set tree with a large fruit-bearing capacity—within reasonable distance from the ground. This tree has not been pruned this season, but it can be seen that it is not very dense in the centre and will require but a light pruning.

The Picholine St. Chamas olive-tree has been kept thinned out, but has been allowed to grow a little too high if anything. Had the top branches been pruned back a little more severely, the tree would have grown broader, but not quite so high.

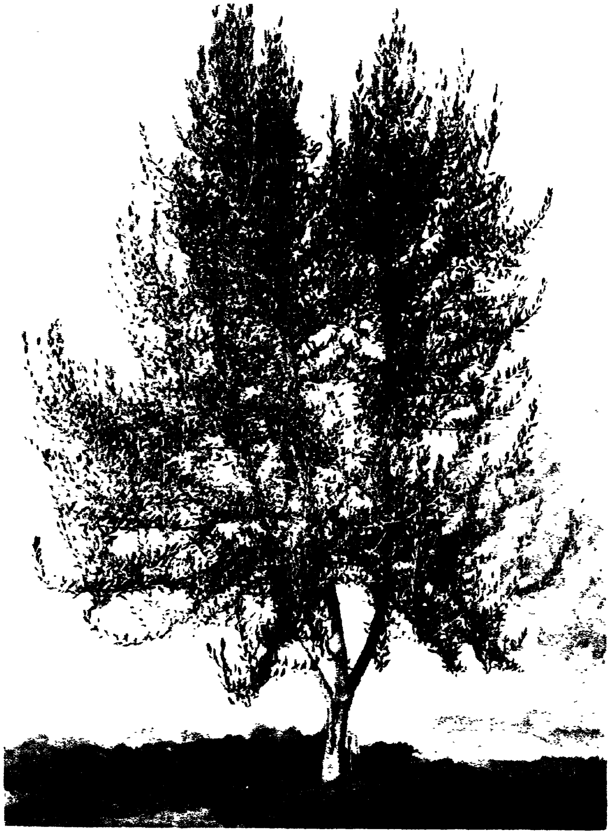
The olive branch pruned and unpruned gives one a fair idea as to how much growth should be removed from a strong-growing variety at time of pruning. The branch was photographed immediately before and immediately after pruning.

The small branch illustrates how the fruit hangs on the twigs of a well cared-for tree.

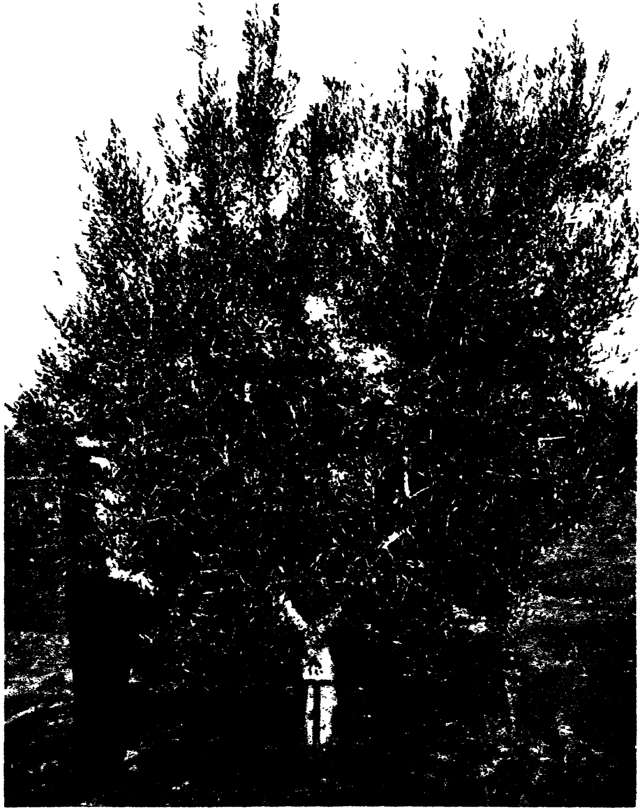
(*To be continued.*)

JAM FOR SOUTH AFRICA.

THE Imperial Government has arranged to obtain from New South Wales, for the use of troops in South Africa, 300,000 lb. of jam—peach and plum. Full particulars concerning the order can be obtained on application to the Department of Agriculture.



Picholine St. Chamas.



Nevadillo Blanco.

Reports on Trials of New Varieties of Sugar-cane, &c.

SUGAR-CANE.

A LARGE number of sugar-cane varieties have been grown at the Experimental Farm, Wollongbar, and from time to time cane-growers have been allowed to obtain sets for planting.

Mr. C. E. Maxwell, of Coraki, writes to Mr. Jackson, Manager of the Wollongbar Farm, and says: "I planted the varieties of cane obtained from the Wollongbar Farm, on the 24th October, 1898, and they are therefore what we call two-year-old-plant cane. I plant all my cane 5 ft. between the rows, and 4 ft. between the stools. As to the soil, it is neither black or red, but a sandy loam on a hillside, free from stones. One thing about the sandy soil is that the cane has never been affected by the gum disease to any extent; the only cane that did show signs of gum disease being the Grey Fiji. I enclose the results of the tests of a number of varieties of canes which I had tested at the Broadwater Mill."

No.	Name.	Average Stalks in Stool.	Average Weight of Cane Stalks.	Average Length of Cane Stalks.		P. o. c. s.	Value.		
			lb.	ft.	in.		£	s.	d.
1	... .	10	7·5	10	3	12·07	0	11	6
2	Baruma Hota	10	7·8	9	0	13·30	0	11	8
3	....	12	7·5	8	6	11·98	0	11	5
4	Mohona	15	5·8	8	2	14·21	0	13	3
5	....	28	4·1	8	1	14·25	0	13	3½
6	Monoa	13	5·2	5	9	14·70	0	13	8
7	Topuaka	12	5·8	6	3	13·38	0	12	7
8	Morris Seedling	10	5·8	6	6	10·41	0	8	6
9	Mahoavu	13	7·2	8	9	13·93	0	11	4
10	Cudgen Purple	18	4·8	6	6	15·31	0	14	2
11	Goboa	18	3·1	5	10	13·92	0	12	11
12	Lania	22	3·6	5	10	11·73	0	11	2
13	Bau Gau	25	2·8	6	3	11·26	0	10	6
14	Goru	25	4·1	6	0	13·83	0	12	11
15	Singapore Ribbon	10	3·6	6	10	11·51	0	10	10
16	Yekarewa	14	6·3	8	4	11·13	0	11	2
17	Black Java	12	4·1	6	3	11·85	0	11	3½
18	Logoa	22	2·8	6	0	13·13	0	12	4
19	Red Ribbon	20	5·5	5	9	12·80	0	12	1
20	Koli a la la	11	5·2	6	9	13·59	0	12	9
21	White St. Louis	22	3·2	6	3	13·74	0	12	10
22	....	18	5·8	14	0	10·70	0	9	3

Mr. Barry, of the Broadwater Mill, says, with the exception of one or two, they show from fair to good quality.

Mr. J. J. Gray, writing from Palmer's Island, Clarence River, on 20th August, 1900, says, "The canes I have grown are now 2 years old, and Mr. R. N. Holden, manager C. S. R. Company's Mill at Harwood, has obtained about 5 tons from me for experiment. I have retained about half the total weight, and am thoroughly satisfied with the return per acre. I am selling some to the surrounding farmers, and exchanging some more, so I think the samples will be well distributed. The manager, Mr. Holden, got a sample of each five stalks tested, and all except the Yekarewa tested 14 and some points, more or less; but the Yekarewa makes up for its deficiency in sugar by its extra weight.

The following are the canes I received from the Wollongbar Farm:—Dani Yekarewa, Monoa, Baruma Hota, Baruma Gana Gana, Baruma Be Ru Ru, Topuaka, Geboa, Koli a la la, Mohona, White Bamboo, Indian Bamboo, Red Bamboo, Hope, Big Yellow, Striped Meera, Black Isaacs, Cudgen Purple, Wappendon, Morris Seedling.

Mr. David J. McAuliffe, of Greenridge, in a letter to Mr. Jackson, says: "I have been very long in reporting upon the growth of sugar-cane and other plants obtained from you two years ago, but I now append particulars.

I obtained 24 slips Manihot aipii, 48 plants Maranta arundinaceæ, 12 roots Ginger, 6 Liquorice roots, and Sugar-cane of the following varieties:—Monoa, Mohona, Yekarewa, Baruma Be Ru Ru, Lania, Baruma Hota, Baruma Gana Gana, Logoa, Baruma.

Manihot aipii.—All grew well, although the soil was rather stiff. Roots were fully 2 feet long and 2 inches in diameter. I planted the Manihot in the same place last year, with the addition of a little sand and wood-ashes, and, although the season was very dry here, the roots were very large. I grated some, washed, and melted it over the fire, then dried it, and it was in every way equal to the imported article, to my idea.

Maranta arundinaceæ.—Grew very well, but soil was rather heavy, and not worked deep enough; produced six to nine large tubers; but last season was too dry, and I have very few to plant this season. It makes beautiful arrowroot. I distributed some to neighbours, but I don't know how it got on.

Liquorice.—Grew like a weed, although in a very dry place, and, in a bed of nut grass, has spread yards, and is now beginning to grow. Dies off in winter.

Ginger.—Has died clean off. Made a start after each shower, and died off when dry, hot weather set in. Tried it in different positions, and in partial shade; but all eventually died off.

Sugar-cane.—Monoa.—Grew very little, on account of late planting and very dry weather. Frost killed it down. Grew between 3 and 4 feet of stalk this season, and was killed again this winter. Stands much more frost than the Grey Fiji. I got about thirty-two plants from the five stools. It stools out well.

Mohona.—Received ten plants; planted two in each stool. Grew much the same as Monoa, but less. I got twenty-eight plants from the growth this year; only one plant from each stalk; all rest of eyes killed by frost. Very little work given the soil.

Yekarewa.—Grew about the same as above, but will not stand near the same amount of frost.

Baruma Be Ru Ru.—Six plants received. Weather extremely dry when planted. Grew very little first season; grew over 4 feet of stalk this season. Tastes very sweet. Is the best grower, and stands frost best of all; although heart was killed, most of the top leaves were green and equal to China cane alongside. The stalks thick, and a heavy cropper. Fifty-five plants this season.

Lania.—Only two miserable stools grew from six plants. Bad frost-resister.

Baruma Hota.—Nearly equal to Baruma Be Ru Ru in every way, but did not resist frost quite so well, nor so heavy a cropper. Red-rot in one stool.

Baruma Gana Gana.—Appeared diseased and poor growth.

Baruma.—Same as above.

I had also received previously from Mr. McKeown:—Mahoavu, White Bamboo, Black Java, Indian Bamboo, Morris Seedling, and Hope.

Mahoavu appeared to be a fair stooler and frost-resister, and good cropper.

White Bamboo was a slow grower, sweet, good frost-resister, but not a desirable variety here.

Black Java is a splendid grower, heavy, good frost-resister, although in a dry spot on top of river banks, two-year-old ratoons, with very slight working, were very high (over 9 feet of cane), and was greener after frost than the China cane, though more exposed to the frost. I have planted all I had this season.

Indian Bamboo and *Morris Seedling* did no good here.

Hope is a very quick grower, in fact the quickest I have seen, but not very sweet, and rusts badly.

Canaigre Roots did no good, and gradually died off.

Ramie was very delicate, and grew very little. Slight frosts kill it down, but roots grow out again. It does not grow so high as that at the Experimental Farm, and it is hard to get the bark off.

Pawpaw Seed.—Grew well. Trees over 12 feet high, but the past winter killed them, though passed through two other winters previous. They are growing out again, and will have a few fruits this season that were not frosted.

Cotton.—Two varieties. Did not produce much cotton. A small variety produced abundantly and continuously till frosted.

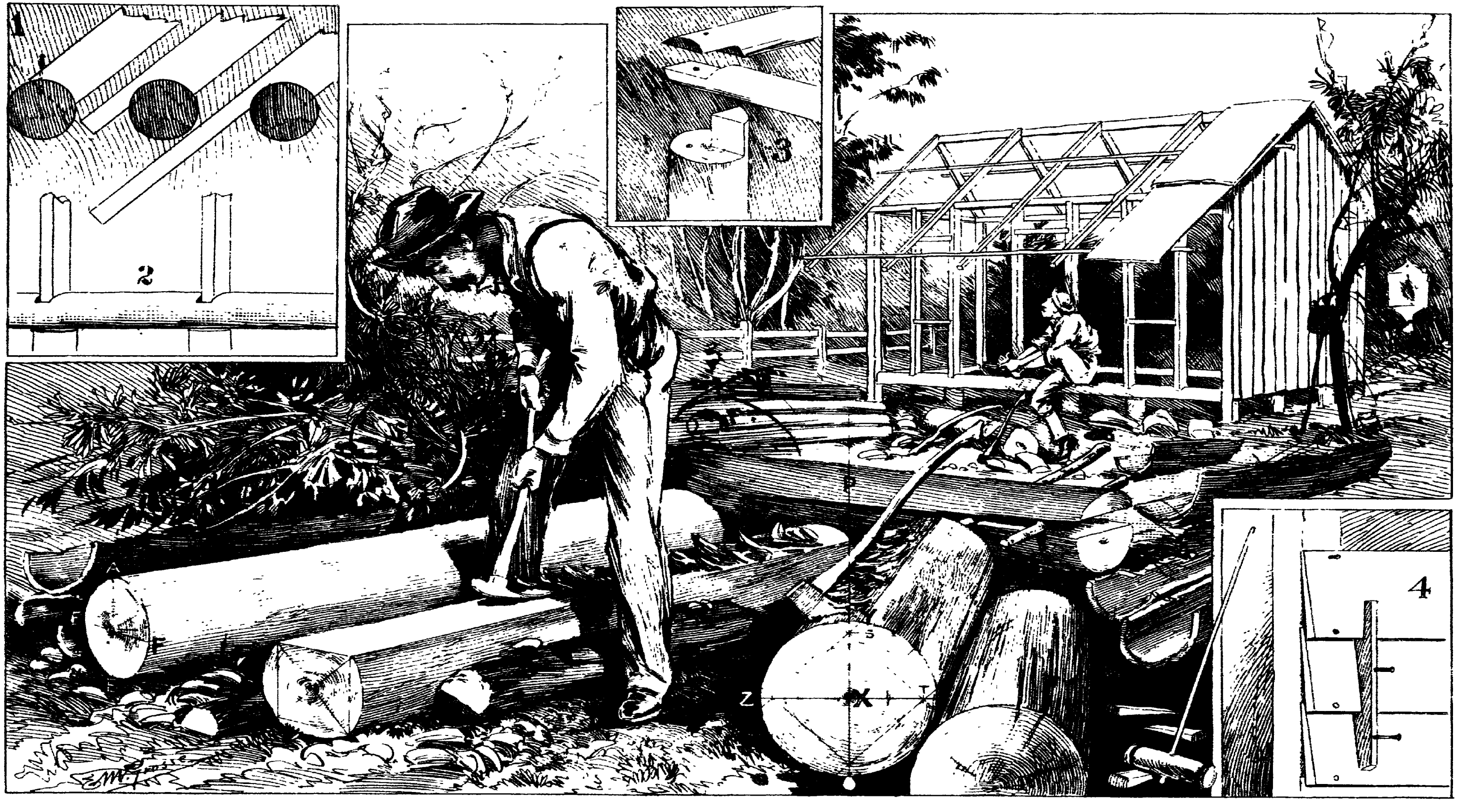
Phormium tenax grows very slowly; received my plants from the Hunter, but they have never grown so high as I have seen them in the Hunter River district.

I successfully cleared the mange off a horse with a recipe of yours in the *Agricultural Gazette.*

PASPALUM DILATATUM GRASS.

MR. JACKSON, Manager of the Experimental Farm, Wollongbar, has received the followimg letter from Mr. Michael Rush, of Minto:—

"In accordance with your request in letter bearing date 3rd August, 1899, concerning the grass *paspalum dilataum*, of which twenty-five roots were sent to me at that time, I beg to report that my observation of the growth of these plants convinces me of its vitality. The growth made by each root since the time of planting has been remarkable, and as the plants have yielded an abundance of seed, it can be safely said that it has adapted itself to the climatic and other conditions which prevail in this locality. I was anxious to see how it would be affected by the frosts during the winter months, and it is gratifying to have proof that the frost does it no injury. I have sown the seed yielded by the above-mentioned plants broadcast on unbroken fallow land, where native grasses are growing, but as to this method of propagation I cannot yet speak, as, up to the present time, I do not see much indication of success. This may probably be due to hard, dry nature of the ground when the seed was scattered. What strikes one most favourably about this grass is the great amount of succulent herbage in every tuft, together with the fact that it is a perennial grass. From the original I obtained a great number of plantlets, which I transplanted, and in every case the growth has been exuberant. I have now seen sufficient of this plant to convince me that if the grass be laid down according to instructions it will rapidly supersede the native grasses, and will, if permanent (a feature which its votaries claim for it), afford a fodder that cannot be surpassed by any native grass. The tufts of this grass, which I have now growing, have obtained a considerable size, and it is evident that it must eventually assert itself over all other herbage which may be growing with it. In conclusion, I may add that my experiments have been made in poor soil, which has been very much exhausted by constant cropping, so that in the ordinary land in this district excellent results with this grass should easily be obtained."



SOME ODD JOBS.

The Farm Homestead.

W. H. CLARKE.

It not infrequently happens when a man takes up an area in some comparatively isolated place to commence farming or fruit-growing, that for the first few years he has to depend almost entirely upon his own ingenuity and labour. In these notes it is proposed to look at a few things from the point of view of a beginner so situated. Suppose we commence with the erection of some sort of dwelling that will serve until, with the progress of the holding, a more substantial and permanent one can be provided. In planning out and building such a place it is just as easy to make provision for a modicum of comfort as it is to shove together a humpy that you have to hold up with both hands on stormy nights.

The material to be used depends upon surrounding circumstances and the length of one's purse. If the selection is in a coastal district, where the hilliness of the country and unfinished roads make carriage of building material very expensive, it will usually be found, in compensation, that abundance of timber suitable for building purposes can be had for little more than the mere felling and hauling.

Now, to go into a tract of rough bushland, choose suitable trees, and construct, single-handed, or with little or no experienced help, a desirable sort of dwelling from the rudely-worked timber, is the part of a settler's undertaking that he is scarcely likely to be able to learn from a book. It depends altogether upon a man's natural aptitude for such work, and general resourcefulness. The only sort of training that would be of real value, would be to pass a month or two in the company of an experienced bush carpenter; but a man with his family dumped in the bush 10 miles or so from everywhere, is not always in a position to undergo an apprenticeship, and naturally feels inclined to try to the best of his ability to turn to immediate account the materials that lie nearest to hand. A few timely hints may be of value to a man in such a position, not because he will be able to carry all or perhaps any of them out to the letter, but because the discussion and illustration of some phases of the subject may prove suggestive. That is the idea on which this series of articles will be carried out; and it is hoped that, for the guidance of "new chums," some of the "old hands" who have, out of meagre material, and with slender monetary resources, built up comfortable homes by skilful bush craft and good taste will contribute information as to their methods. It damps the fire of a man's enterprise to swelter all day and return to a dwelling that is a bung-eyed, lop-sided blot on the landscape, where there is never a nook for a woman to take pride in, nor a patch of anything more inspiriting than a fly-soiled newspaper supplement. In a young country, and under conditions imperfectly understood, slip-shod methods and makeshifts naturally find a place of favour, but a new era is setting in, and since the advice about setting one's house in order is a precept that not even critics can cavil at, we will see what sort of a little place a man can put up with nothing handier than round timber within reach.

A Slab Cottage.

A very cosy place can be built of slabs, even by a man without much training as a carpenter.

When sawn timber is to be used, it is customary to lay out your plan, work out specifications, and tell the timber man to cart it round in the morning. When the timber yard is the swaying forest, it is not a bad plan to have a good look round among the trees first, and calculate possibilities. Of course some dimensions have to be decided upon, and, say, for a start, a couple of rooms and a skilling kitchen will suffice. For the two rooms, a wall length of, say, 24 feet by 12 feet wide will allow of one room 10 by 12 and one 14 by 12.

In the way of posts, there will be required four pretty stout ones for the corners and two for each doorway and each window. In fixing up the frame, matters should be so arranged that, instead of the usual earthen floor planks can be laid. A good idea is to let the floor-plates into the corner posts by means of a mortise, like a rail, using substantial timber squared along the top, and supported at intervals, so that the door and window posts may rest upon it, as shown in rough sketch. It will be noticed that the corner posts are let into the ground a little. The floor-plates would be put in before the top-plates are put in position.

The top, or roof-plates, should be fairly stout, squared on the outer side only. To fasten them securely to the corner posts, and to avoid any joinery more intricate than can be accomplished with mortising chisel or axe and saw, the top of the corner posts should be cut as in fig. 3, and the top-plates joined by cutting out as in same figure; then they would be overlaid, and made secure by driving a strong spike through a bored hole (to prevent splitting) into the top of the corner post, and, if additional security were deemed necessary, a couple of spikes into the projecting piece. Joined in that way, the frame would be immovable. Before the top-plates are put in position, it is necessary to cut out a mortise for the window and door posts. A block and a few lengths of rope are invaluable in building a house with heavy timbers. To get the top-plates into position, a stout sapling about 3 feet longer than the corner posts can be lashed straight up against them, so as to stand a couple of feet higher than the top. If two blocks are available, one should be made fast to the top of each sapling; but if you have only one, you can hoist up one end of the plate first, make it fast to the sapling, with sufficient slack to lower it into the right position, and then hoist up the other end. Make that fast, and then you can get the door posts, &c., adjusted and fitted with greater ease. Whenever a mortise is made in round timber, there should be a piece the width of the shoulder cut out and trimmed flat, the hole being cut out in the flat space, the stud will fit in true and firm.

The Roof.

In a building of the dimensions indicated, and where a simple gable roof is adopted, not many rafters will be required. The greatest difficulty will be experienced in determining the proper angle to cut the upper ends to firmly meet the ridge-plate. If a board or batten cannot be procured for the latter purpose, it would be a good plan to cut out the round timber used so that it will be flat at each place where the rafters will come.

Where the rafter rests on the top plate, a place should be cut away as shown by dotted lines in the diagram, Fig. 3. The rafter can if desired be carried out some distance, as in illustration, to form a wide eave or even a verandah. The place in the top-plate for the rafter to fit into can be prepared by cutting in with the saw and knocking the piece out with a chisel.

There are several other ways of fixing the roof, but where the extensive squaring of timber and the delicate adjustment of angles, such as can so easily be carried out with sawn timber and plenty of tools, are to be avoided, it is thought the one suggested will be about as good as any.

There can be no question that, on the score of cheapness and comfort, the old stringybark roof cannot be excelled. But nowadays, roofing iron has become so cheap that it is scarcely worth while bothering about bark for dwellings. Besides, to the settler, roof catchment for water for domestic use is a serious consideration, and on that account alone anything but galvanized iron is not to be thought of. Where a place is built low and there is no ceiling, the sweltering discomfort of an iron roof can be somewhat diminished by having in the gables large openings on hinges that can be operated with a piece of string, and closed in wintry and wet weather. In hot weather the continual passage of air through the openings will make the house far cooler.

Slabs.

Nine feet will be ample for the slabs, which are split out very much in the same way as fencing rails. It is necessary to have, however, at least four or five good wedges and to take particular care to nick well and deeply with the axe along the splitting-line, so as to preserve as nearly as possible uniform width and thickness. Before putting into place, the edges of each slab should be trimmed level, so as to fit closely. If a really neat job is desired, every slab should be gone over with the adze, and all the rough clumps of splinters and unsightly excrescences shaved off the back and front. Then the slab should be ruled along the edges with a chalk line, stretched from the narrowest part. Everything down to that line should be cut away. This work can be greatly facilitated by driving a set of pegs deeply into the ground so as to keep the slab securely in position on its edge whilst being adzed. When the slabs are split out of green logs, and used for building purposes immediately, it must be remembered that a considerable shrinkage will occur as the wood becomes weathered; so that a wall that seems weather-tight during erection may, at the expiration of a few months, become as open in the seams as a cane basket. Under such circumstances it is next door to impossible to have a slab wall sufficiently tight for comfort without strips of zinc or plaster on the crevices. If zinc or metal of any kind is to be used on unseasoned slabs, the strips should be only temporarily tacked on at first, and then, when the shrinkage of the timber has practically ceased, the strips can be made secure. Where clay packing is used, the material simply falls out as the space between the slabs increases.

The Floor.

For the floor joists, stout saplings squared on the upper surface and where they rest in the plates could be used, but sawn boards would be indispensable. To get the joists quite true so that the boards will lay evenly upon them, it is a good plan to leave the thicker end a bit full where it rests on the plate, and then use the spirit-level and trim down as required, adzing off a chip at a time. This takes a bit of time, but it is worth it, because there is really nothing so uncomfortable as a badly laid floor.

Doors and Windows.

Ready-made doors of all sizes and ready-glazed sashes with frames ready to fit right in can be procured now-a-days so reasonably that they are cheaper, even with heavy carriage rates, than anything a man can make for himself.

Kitchen and Fireplace.

One side of the kitchen is already completed when the back of the cottage is slabbed up. The frame for the other sides can be made with little trouble. Two corner posts and two door posts will support the plates for the roof which can rest on rafters carried right out as shown in Fig. 1.

For the kitchen a floor is not so necessary, and the slabs can be rested on the ground or let into a grooved log.

The fireplace in a good many cases is a serious difficulty. It is not unusual to find where a huge, unsightly, cavernous structure occupies almost the whole side of a room, that the smoke will go everywhere but up the chimney. That is because the fireplace opening is too high and the chimney too big. A sheet of tin that can be adjusted on a couple of nails, so as to lower the opening, can be used with good effect in wet and gusty weather; but it is better, if possible, to get a piece of thin sheet iron, which can be bent round a log and bolted together with the sort of cheap little bolts they use for galvanised iron, to make a smoke stack, which can be fitted into any crudely constructed fireplace, and will draw well, provided the collar, or smoke approach, is kept well caulked with clay or something to prevent a bye-draught.

Squaring Timber for Building Purposes.

It will be noticed in connection with the suggestions above as to the frame of a slab building, that many of the frame plates and posts will be squared on one or more sides.

For determining how much it is necessary to cut off a piece of round timber, say, 20 feet long, 12 inches diameter at one end, and 9 inches at the other, so as to get a flat face in a true line the whole length, there is one fairly simple way that can be followed safely by the novice. Haul the log to a place where it can rest evenly on the ground and fix it securely with chocks on each side. With a plumb-bob (a pocket-knife swung on a couple of feet of string will do) strike a line as shown in dots A B through the natural centre of the smaller end of the log. As a rule, if the natural centre is not quite clearly defined, the point can be guessed sufficiently accurately. When the line A B is marked, another line, E F, at right angles to it, and running through the centre, should be made. In doing this it is wise to use a square, so that the four segments into which the two lines will divide the end of the log may be practically equal.

Then the big end is marked out in a similar way, care being taken to get the plumb line at the large end in direct line with that of the small.

A line ruled from the points A to E will show how much is to come off the small end to get a square face. From the centre to the rim of the small end is, in the log under discussion, 4½ inches. To bring the large end down to this, so as to get a straight face, measure off 4½ inches from the centre along the lines X Z and X Y, and a line, S T, struck through those points will show the segment to be adzed away.

That done, a piece of string long enough to stretch along the log, is well chalked or charcoaled and fastened lightly from A to Z; the tighter it is pulled the better. By placing it in an axe-nick will keep it well down on the log. Then the string is picked up in the middle and suddenly allowed to fall, thus making a guiding line that can be furrowed with a nail or something lest it be rubbed out. A similar line is marked along the line E Y. The log is rolled over so that it will be easy to get at the skelp to be cut off. Some people, expert with the adze or broadaxe, can sail right in and square off a log almost by instinct, but where one has had little experience in the work, there is a certain amount of danger in using the adze. Personal security and a better job can be insured by using a crosscut saw to cut in at intervals of about 8 inches along the length of the log not quite as deep as the guiding lines. The chunks of wood can then be lifted off speedily, and if the adze does want to fly a bit there is always the next section for it to cleave into instead of one's shins. The dressing down to the guiding line must be done carefully, and it is not a bad plan for a novice to use a little piece of batten as a straight edge to guide him until his eye becomes accustomed to judging whether he is scooping too deeply or leaving ridges.

If more than one side of the timber is to be squared, the parts can be measured off in the same manner as shown on the end of the log in the illustration.

The device shown in Fig. 4 is a good one to adopt when erecting ordinary weatherboards singlehanded. The nails are used in bored holes and just driven slightly.

Bee Calendar.

ALBERT GALE.

NOVEMBER.

PHYSICALLY a bee-keeper requires a good pair of eyes that have been trained to keen observation, and a pair of sensitive ears that are trained to detect the various sounds that are emitted by bees. This month he will require both eyes and ears constantly at his work. Bees readily inform us of their likes and dislikes. They have a language that is easily translated by bee-keepers of experience, who must act according to the requirements indicated. Watch and listen.

This month bees will seize every favourable day to swarm; if they do, you must be prepared. Spring food has been fairly plentiful, although many a swarm has had a hard fight to pull through the past winter. The prospects for a large honey flow are very encouraging. If not desirable to increase the number of hives in the apiary, check all swarming. Search the hives about every twelve days or fourteen days, and destroy all constructing queen cells. Should a swarm issue forth, kill the queen accompanying it if you can find her. If not, search the hive the swarm came from; there will not be much trouble in finding the queen. Kill her, and then put the new swarm back from whence they came. This will cause a delay in the breeding of a few days. If you wish to make any alteration in the position of your hives, now is your chance. As soon as a swarm leaves the hive, and you have secured them in the reception box, remove the parent hive to the new position required, then place a clean empty hive, properly fitted, in the place of the old one, and shake the fresh swarm into it. Or you may remove the old hive to a new position, and return the new swarm and unite it with the old when in a new position. The old stock should be removed as soon after the new swarm has gone forth as is convenient.

See that there is plenty of room in the brood chamber for increase. Do not let new swarms, when they have settled, hang out in the sun. Give plenty of ventilation. There should be plenty of honey to extract. As far as possible, keep the various flavoured honeys separate; it will make a good deal of difference in the commercial returns.

Farm Notes.

NORTHERN RIVERS DISTRICT.—November.

H. V. JACKSON.

Growing crops will require all necessary attention at this time—and, if showers are few and far between, the surface soil should be kept disturbed, thereby helping to retain moisture in the soil and keeping down weeds. It is late sowing for cabbage seed, but where you have a good nursery bed of well-grown plants they may be planted out during favourable weather.

Tomatoes should be grown in such a way as to keep them off the ground—and diseased fruit should be picked off and destroyed. There should now be plenty of lettuce fit for use—and coming on—they are exceedingly welcome during the hot summer months for making salads, &c. If the nursery seed-beds have been used up, and more lettuce is required, it will now be advisable to sow the seed where the plants are required to grow; for if transplanted at this time they will frequently run to seed.

Thin out young onions, and keep the land free from weeds. When transplanting young vegetables at this time—if the weather be dry—water them well before moving, and, in taking them up, keep the roots intact, and with as much soil about them as possible; and when planted in their permanent situation water them again. Thin out the rows of beetroot where they appear to be too thick.

French beans will now be plentiful, and the pods when nice and young and tender, should be picked fairly constantly, so that the plants will continue bearing. Sow seeds for fresh supply as largely as required.

Where oats have been cut for hay, some of the land may be ploughed and made ready for sowing Amber Cane, or other varieties of Sorghum, which may be put in the ground whenever the weather is favourable.

Broom millet also may be sown; it will be as well to sow the broom millet at different times, in only moderate sized plots, so that you will not have a big area of crop all ready for treatment at one time. If you sow an extensive area at one time, it may require harvesting at a time when you can ill spare all hands, or the time to devote entire attention to it, and get it properly saved.

Maize may still be sown. Previously sown plots should be making good progress. For green crop, Ninety Day maize gives excellent results.

Pumpkins and melons may be sown, and those already planted and now well grown will only require to be kept clean, lime dusted to check the insects or beetles, and occasionally pinched back.

Cucumbers should be gathered when large enough and fit—if left on, the vines will cease bearing.

Large grammas may be extensively sown.

Both garden and field peas should now be plentiful.

Rhubarb should be shaded—with side-shade breaks—to ensure the growth of good, well-grown, upright stalks. In this climate, if grown in an exposed manner, much of the strength of the plant will go to the leaf, and the stalks, though thick, will be short and stumpy, and laying over. By shading the beds of rhubarb with side-shades the stalks will grow more upright and longer, and there will be more really marketable rhubarb stalk and sufficient leaf only.

Some rye crops will be fit to harvest.

Pine-apples and bananas may be planted.

Spray grape-vines with Bordeaux mixture to keep down oïdium. Thin out fruit on trees that are heavily bearing, if you want good fruit.

If the weather is very hot and dry, mulch the fruit-trees with stable manure, or dead grass or leaves. If you wish to have fine grapes, remove some of the young bunches, and stop the shoots by pinching off the tops.

Experiments have recently been made with the fumigating process under tents to destroy scale, &c., on fruit-trees, and with marked success. One of the worst troubles to contend with here has been the Bronzy Orange Bug, on which spraying had little or no effect. It is found, however, that the fumigating process kills a great many, and causes the insects to fall in heaps under the trees, whether dead or alive, and so enables the orchardist to sweep them up and burn them. Particulars of the process has already appeared in previous issues of the *Gazette*, by Mr. W. J. Allen, Fruit Expert, and a card showing the quantities of cyanide, &c., to use for trees of various sizes can be obtained on application to the Department of Agriculture.

RIVERINA DISTRICT.—November.

G. M. McKEOWN.

Maize.

Crops above ground should be harrowed with light implements, and as they advance in growth the land between the drills should be well worried with the horsehoe.

The practice of hilling maize is objectionable, and the crop should always be cultivated on the flat, as by the latter method the destruction of roots is far less than is the case when 'hilling' is carried out.

Where possible, irrigation should be resorted to.

Sorghum.

Owing to the favourable season seed may be sown to a limited extent, using 8 to 10 pounds of seed of Planter's Friend or Amber Cane per acre. Deep alluvial soil on river flats will give the best results. Growing crops should be well cultivated with the horsehoe.

Millet.

May still be sown in thoroughly prepared land using 12 to 15 pounds of seed per acre for broadcast sowing. The Hungarian and Japanese varieties will give the best results. The crop if intended for hay should be cut before the seed forms.

Pumpkins and Melons.

While the vines are short the land should be kept well tilled with the spading harrow or horsehoe.

Keep a watch for beetles or other destructive insects, and as a preventive, dust the plants occasionally with air-slaked lime or wood ashes. Mulch and water as liberally as possible.

Tomatoes.

Transplanting should be completed without delay. Plants should be well mulched and watered and trained to stakes as growth increases.

HAWKESBURY DISTRICT—NOVEMBER.

By GEORGE VALDER.

Maize.

Sowing operations should be rapidly pushed on. The cold nights experienced during last month did much to retard the growth of the early crops, and in many instances the later sown ones will apparently give better results. The soil between the drills will require plenty of working, the rains have in nearly all instances been followed by strong drying winds, and unless the cultivator is put through the crop frequently the soil will cake. It is also very necessary that the weeds should be destroyed as soon as they appear.

Very little has yet been done in this Colony towards importing improved maize-harvesting machinery. Several "corn-harvesters" have been obtained and are working well, and in Queensland the maize-thresher is being used to great advantage. But it seems to me much greater advance can be made by introducing the "corn-husker and fodder-shredder." In using this machine the cost of harvesting can not only be greatly reduced, but the "stover," *i.e.*, the entire stalk, leaves, and husk, can be used for fodder. This stover varies very much in quality, the percentage of moisture, for instance, depending greatly on the weather, means of curing, &c. As a rule the stover of the smaller varieties has a greater feeding value than the larger kinds. Some of the quick-maturing sorts, seed of which was imported from America by the Department, appear to be very suitable for the purpose. If sown late they would be at the right stage for cutting when the weather begins to cool, and the stover would then be in a good condition for putting through the machine, as it requires to be tough and damp, not dry and brittle. Strange as it may seem this stover is well digested, but being a starchy food it requires feeding with some nitrogenous substance to give the best results. Two of the best fodders for the purpose are lucerne and cow-pea. Used in this way it has been estimated that an acre of maize stover is equal to an acre of hay (say 1½ tons). Recognising that much of the value of the corn stover depends upon the time of cutting, the Americans are perfecting combined shredders and huskers which will handle large quantities of fodder expeditiously. One of these machines was imported by the Department, and is now at the College. It was tried last year, but in consequence of the dry season most of the maize crops were unsuitable for treating, and therefore the trial was hardly a fair one. The result was, however, satisfactory, and I intend to put a considerable quantity through the machine during the coming season. The crop is cut with the corn-harvester when about half of the leaves on the plant are dry, as there is then the largest total amount of digestible food material in both grain and stover. The corn is cut and tied in sheaves and stacked, in order that it may properly cure. Some farmers adopt the plan of tying the tops of the sheaves together, in order that they will shed the grain. After curing, the sheaves are carted to the machine, which shreds the stover and husks the cob at the same time. The grain, when harvested in this way, is generally slightly shrivelled, and brings a little less in the market than when it is harvested in the ordinary way. But the stover is of much higher feeding value, and if it is thoroughly shredded the animals will eat it readily. For sheep and milch cattle it gives the best results if moistened and mixed with chaff and small quantities of grain.

Many specimens of maize affected with smut were sent in last season for identification.

This species of smut affects corn alone, and, therefore, it can be eradicated by changing the crop. All smutted stalks should be carefully gathered together and burned. The disease is, however, often also spread by means of the seed—the spores adhere to the seeds, and being sown with them enter the plant in its early stages and grow with it. After a time patches are seen in various parts of the plant, the cobs especially being affected and soon becoming a ball of smut. This can be prevented by soaking the seed in a solution of bluestone for fifteen to twenty minutes; about the best strength being 1 lb. bluestone to a gallon of water. The Jensen hot-water treatment can also be recommended. The spores adhering to the seeds are destroyed by the treatment. Once the smut attacks the crop no treatment will be of any benefit.

Sorghum.

As soon as the wheat and oats are cut for hay, plough up a portion of the land and put in a crop of sorghum. Sow the seed as soon as rain comes, and in most seasons heavy crops of forage can be obtained for use in autumn as green fodder, and also large quantities can be stored in the form of ensilage for winter and spring use. It is generally considered that it is more difficult to make good sorghum silage than it is to make maize silage. The reason for this, no doubt, is that sorghum has a great tendency to develop acidity. It therefore requires to be very quickly made, *i.e.*, the silo must be very quickly filled. Like maize, it should not be fed alone; if possible, in filling the silo, mix lucerne or some other leguminous fodder with it.

The seed is very similar to shelled maize, but has not quite as high a feeding value; mixed with oats and peas it is a valuable food.

It is also a valuable fodder for grazing pigs on. Quick-growing varieties which are short in the stalk and produce heavy crops of seed, such as Milo maize, being especially valuable. Early varieties, such as amber-cane and orange-cane, are also very suitable for this purpose. Even for grazing, however, it is best to feed some other crop with it, such as lucerne, cow-pea, &c.

Broom Corn or Broom Millet

Can still be planted. Crops that are above the ground should be thinned out when a few inches high. This is rather tedious work, but will pay, as it means a more even growth, and the plants mature evenly.

Millet.

I would advise farmers who have small patches of land not sown with maize or other crops to at once put in a crop of Hungarian millet. Should we get anything like the average rainfall, millet, being a good drought-resister, will yield a heavy crop of forage. This crop can be cut in the same way as wheat or oats, viz., with a reaper and binder.

Pumpkins and Melons

Should receive attention this month, as the resulting crop depends to a great extent on the cultivation given during the early stages of growth. The weeds should be kept down and the soil between the hills given a thorough stirring. In dairying districts the Rio pumpkin should be largely grown. It is, as a rule, a heavy cropper, and forms a valuable addition to our autumn and winter fodders, being extremely valuable for cows and pigs.

Root Crops.

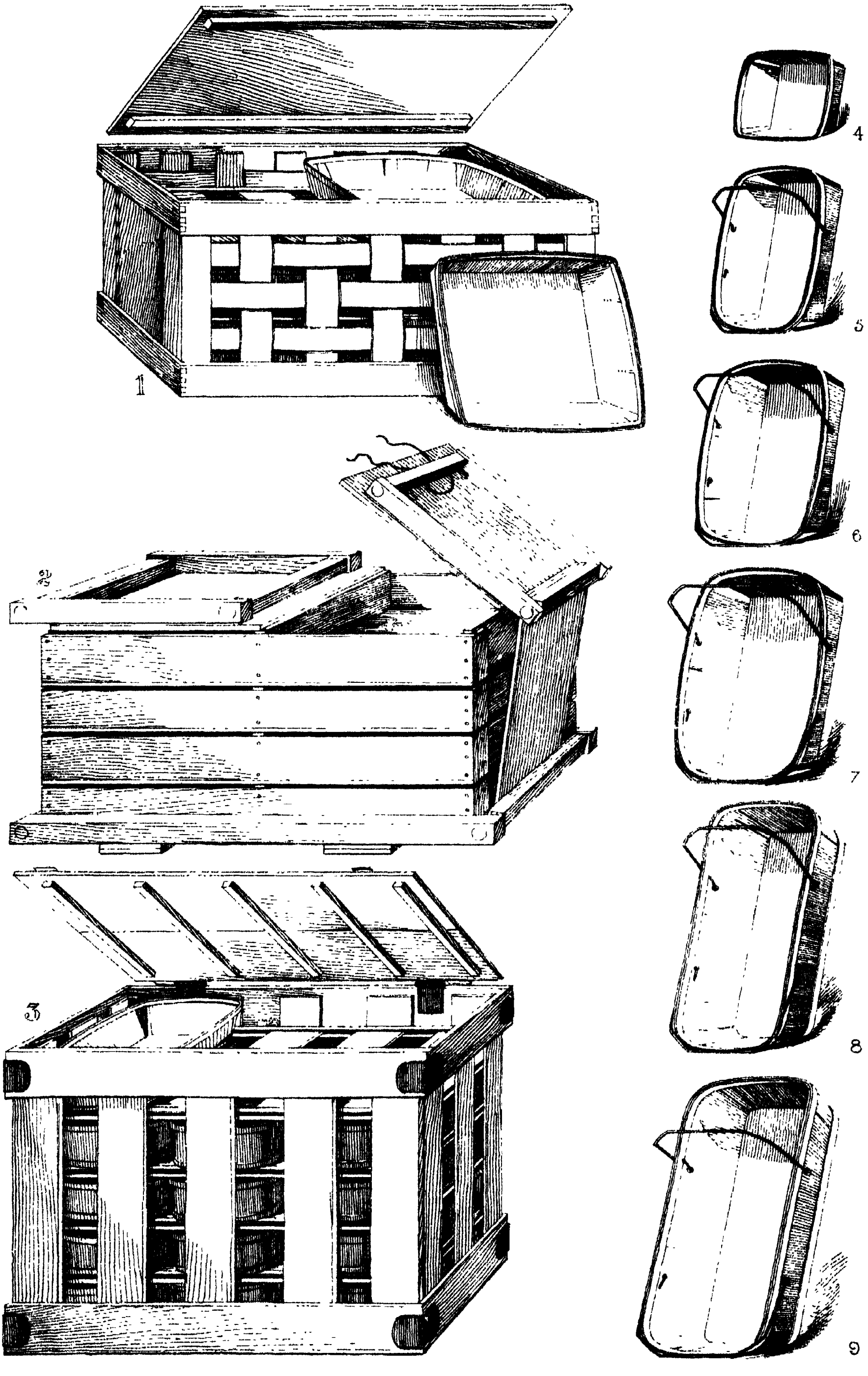
Mangolds and Sugar-beets should be thinned out as soon as the plants have four leaves. Keep the ground free from weeds and well stirred. Should the plants appear to be growing rather slowly, top-dress with small quantities of sulphate of ammonia and kainit. If sowings are made this month sow somewhat thicker. Late crops should always be more thickly sown than the early ones.

Leguminous Forage Crops.

Cow-peas, Soy Beans, &c., can still be sown. From present appearances, I think that the heavier crops will be obtained from the late sowings. I notice that in the United States several varieties of cow-peas have been introduced which mature much more quickly than the varieties under cultivation here, and I am endeavouring to obtain seeds of these for trial here. Early maturing varieties would be especially valuable for late sowings in seasons which had been unfavourable for the early crops.

The Florida Velvet Bean, which has of late years been advocated as a valuable crop for green-manuring in warm countries, has come in for considerable notice lately. In Queensland, and also in this Colony, it has been tried in very small quantities; but, so far, the reports received are very conflicting. Until the crop has been tried on a large scale, it is hardly fair to say whether it is a valuable acquisition to our leguminous crops or not. Small sowings have been made at the College Farm, and the seed produced will be carefully saved in order that a trial on a large scale may be made as soon as possible.

On light, porous soils the cultivation of pea-nuts for feeding to pigs will often pay. In favourable situations and in a fair season the crop will mature in three months, and the pigs can be turned in to feed the crop off in less time than that. The forage, when the pods are about half-formed, is excellent feed, being, it is said, richer than red clover.



BASKETS AND PACKING CASES FOR MARKETING TENDER FRUITS.

Orchard Notes.

W. J. ALLEN.

NOVEMBER.

FOR those growers who cater for the very early fruit-market, this will be a particularly busy month, as, in addition to the picking and marketing of such fruits, the cultivation must not be neglected.

The grower of citrus fruits, who is so fortunate as to be located in a district where the oranges hang until this month, will also be busy marketing the last of the main crop, for which there is always a good demand at very remunerative prices. For those who are growing soft fruits, which are easily injured when packed in ordinary fruit cases, it may be of interest to see the style of cases which are used in many of the fruit-growing centres for marketing the best grades of such fruits. These cases are particularly useful for packing the following varieties of fruits for market, viz.:—Peaches, apricots, berries, figs, and soft varieties of plums. *The cuts show the different-sized baskets, and the way in which they are fitted into the crate, which latter, after the fruit has been marketed, is returned to the owner, when it can be filled with a fresh lot of chip baskets full of fruit; and in this way the crate is kept in use for several seasons. Fruit carried in these baskets always arrives in good condition, and, in consequence, commands paying prices. I would recommend those who have specially fine fruit to handle to give these cases a trial. Growers who are marketing these soft fruits must not allow them to hang until too ripe before picking, but pick as soon as the fruit is well coloured, and while it is yet firm, when it will be found to carry better and sell better than when it has been allowed to hang until ripe, in which latter case it usually reaches the market in a damaged and bruised condition.

In districts where the fruit-fly has been troublesome in previous seasons, I would recommend the growers to be particularly careful in picking up and destroying all fallen and fly-infested fruits, and boiling same, in order to ensure the destruction of all larvæ contained therein. As this is the only sure way known at present of helping to keep down this pest, I would urge on the growers the importance of doing their best to destroy these larvæ.

Keep the cultivator going, so as to prevent the moisture in the earth from evaporating too quickly. During the hot weather use only small tines, so that the moist soil will not be turned up; all we require now is to keep the land well stirred and free from weeds.

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*Fig. 1. Export crate holding 40 lb. (1 bushel) in trays.
Fig. 2. Square peach trays fitted into frame.
Fig. 3. Crate for small-fruit trays.
Fig. 4–9. Baskets or Punnets, 1 lb. to 10 lb.

Keep a close watch on all newly-planted trees, and, if they show signs of distress, make a small basin around the tree, and at a distance of at least a foot away, and give the tree at least two buckets of water, but do not allow this to come in direct contact with the trunk of the tree. In making the basin a little soil may be put around the trunk, so as to keep the water away. As soon as the soil is dry enough, and before it cakes, have the basin lightly fork-hoed and filled in.

Where irrigation is practised, a thorough watering should be given all trees towards the end of the month; this should be the second watering of the season. Be most careful to keep the water confined to the furrows, as wherever the land is flooded it is liable to become hard. As soon as the furrows are dry enough to work, cultivate the orchard twice, and loosen around any young trees with a fork hoe.

In former years I have had many complaints about fruit dropping from many varieties of trees. In many cases this is caused through lack of moisture, which, in many instances, can be traced to negligent cultivation.

Every care should be taken to destroy the codlin moth which makes its appearance about the time the apples finish blooming, lays its eggs on the young fruit and leaves, and, after hatching, works its way into the apple, and within a few weeks emerges and lowers itself down to the ground by a silken thread, and immediately seeks shelter by crawling up the tree and getting into any crack, or underneath any old loose bark, either on the tree, on props, or any loose rubbish which will provide a hiding place. The orchard should, therefore, be kept free of such rubbish, and all trees bandaged at a height of about 18 inches from the ground. In the bandages the grubs will harbour, and therefore these should be removed every ten days, and all grubs killed.

All citrus trees attacked by Maori, or other fungus disease, should be sprayed with Bordeaux mixture. Towards the end of the month, spraying for red and other scales should be thoroughly done.

For the purpose of again testing the efficiency of several of our known best sprays, I am desirous of taking an acre of orchard, badly diseased, and treating say twenty trees with each of the following mixtures, viz., resin and soda, kerosene emulsion, pure kerosene and water, blue oil emulsion, and hydrocyanic gas, in order to ascertain positively which of these will prove most effective in eradicating the scale from the trees, and also to compare the cost of the different treatments. I will only be able to carry on such an experiment in one place this year, but would be pleased to have an acre of orchard offered me by one of our prominent Fruitgrowers' Societies in the centre of the orange-growing country—somewhere in the vicinity of Dural, Galston, or Kurrajong—at some place easy of access, and where help could be obtained. Should any Society in these districts be desirous of having such experiments carried on, I would be pleased if they would communicate with me; and as soon as I had decided which orchard to accept, I would make the necessary arrangements and proceed to carry them out.

Practical Vegetable and Flower Growing

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF NOVEMBER.

Vegetables.

THE season throughout most districts of the Colony has been favourable for the growth of vegetables, but here and there hot winds have shrivelled tender growths, and late frosts have injured tomatoes, French beans, cucumbers, melons, and other kinds of vegetables.

Asparagus is yielding very satisfactory supplies to those who are fortunate enough to have planted. Old plantations that are more than three years planted should yield extensively for some time to come. It is rather to be wondered that this vegetable is not to be seen more frequently in kitchen gardens.

Tomatoes in the North Coast Districts should be producing ripe fruit in abundance, unless the plants have been injured by frosts.

Spring weeds should be destroyed before they make much progress, and if frequent cultivation be carried out, it will not only keep down weeds but improve the growing vegetables to a considerable extent.

Beans, French or Kidney.—Plants in the warm districts should be producing abundantly and will continue to do so for some time if the beans are gathered before they become large or ripe. The beans when young are much more palatable than when old, hard, and stringy.

Young plants which are advancing should be kept free from weeds by frequent cultivation between the rows. Seed may be sown to any extent desired with good prospects of a crop.

Bean, Lima.—This is a useful kind of bean, very productive, and not difficult to grow. There is a dwarf or bush variety as well as a tall growing or rambling variety which needs some support and can be made useful for covering a fence or wall, stump or log. Seed should be sown now or at any time during the spring.

Beet, red.—Try the globe variety, which is excellent, and perhaps to some extent easier to raise than the long-rooted varieties. Red beet is generally much in favour during the summer months, for then it seems to be more palatable and agreeable than at any other time; and so are all the plants termed salads.

It will be better to sow but few seeds at a time, and if only a dozen plants or so were raised every week this would be better than raising a great many to mature all at the same time. By dodging a little and working in spaces which become vacant although it may be by the removal of a few cabbages, and by keeping the whole vegetable garden constantly under crop very much less space will be needed than if bare spaces be left awaiting until the whole of a crop has been removed. What I mean is that if you have, say, a bed of cabbage—100 cabbages, for instance—probably after cutting begins not more than a dozen may be removed in the course of a week. Well, if such be the case, or if only half a dozen be removed, do not wait until the full hundred have been removed, but set to work at once and fill up the space where the half dozen or dozen were growing with some other kind of vegetable, and red beet will come in admirably. It would be just as well to soak the seed well before sowing, but if you do so take the precaution of watering the soil most thoroughly after sowing.

Beet, Silver.—There may be sufficient plants from a former sowing to plant out, but to assure a supply sow a few pinches of seed in a seed-bed. Old, well-grown plants should be furnishing a good supply of leaves. This is one advantage of silver beet—that the plants continue to produce leaves for a considerable time if care be taken in gathering them, and to remove only the outside leaves. Use abundance of manure in preparing land for the silver beet, and whilst it is growing apply manure in a liquid form.

Broccoli.—This is not likely to succeed very well in the hot parts of the country, but, where the districts are high and cool, some plants should be set out, and a little seed should be sown.

Cabbage.—Sow just enough seed to keep up a supply of young plants, and plant out any well-grown, strong young plants from the seed-bed. The land for cabbage should be heavily manured prior to planting, and liquid manure occasionally will improve the plants. It is very desirable to give cabbages a good start, otherwise they are liable to suffer from the attacks of cabbage aphis to a greater extent than if the plants are weak. For the cabbage caterpillar, spray the plants with a mixture of Paris green and water with some lime—say 1 lb. of Paris green to 200 gallons of water and ¼-lb. of lime.

Carrot.—Sow a little seed in drills about 12 inches to 18 inches apart. Keep the plants free from weeds when they appear above the ground, and thin them out by degrees.

Cauliflower.—Sow a little seed in the cool, elevated districts. Shade and water.

Celery.—Sow a pinch of seed in order to keep up a supply. Prick out a few plants from former sowings, and plant in shallow, well-manured trenches good strong plants—a few at a time. Celery needs most liberal feeding and plenty of water during its growth. Plants nearly full-grown should be earthed up, taking much care to avoid dirt or any substance falling in between the leaf stalks.

Cucumbers.—Plants should be well advanced by this time, and in early districts cucumbers should be available; but late frosts did a good deal of damage, and checked growth in many places. Seed may be sown for an additional supply if necessary. Pinch the ends of the vines to prevent straggling growth.

Cress and Mustard.—Manure a yard or two of ground well manured. This crop will need well watering during the dry weather.

Egg Plant.—Plant out seedlings, which are strong enough, about 3 feet apart. Sow a little seed if more plants are required.

Leek.—Sow a little seed in a seed-bed to keep up a supply. Plant out any young leeks that are large enough, to richly-manured land, rather deep in the soil. Use water and liquid manure freely.

Lettuce.—This vegetable has an objectionable practice of "bolting" to seed if planted out during the summer months, and it has been found that plants grown without transplanting are less liable to run to seed; therefore, sow seed in rows, and thin out the plants when large enough. Manure well, and keep the plants growing on from the start.

Maize, Sweet.—Sow a few seeds 4 feet apart, and, when the plants come up, cultivate them, and continue to do so as long as possible.

Melons.—The vines should be growing satisfactorily by this time. To prevent straggling too much pinch back the ends of the shoots and keep the plants as compact as possible.

Okra or *gumbo.*—Plant out a few seedlings if any are ready. Sow a little seed if no plants have been raised.

Onion.—A little seed may be sown with a chance of success. Any onions that are growing should be kept free from weeds and sprinkled with a mixture of half soot and half salt. This will have a good effect on the growth and is thought to prevent attacks of onion grub.

Peas.—Sow only in cool moist districts.

Capsicum or Chilli.—Plant out a few seedlings or sow a little seed.

Potatoes.—Plant out a row or two, with good, clean, medium-sized seed. Reject any that show signs of scab or potato moth.

Pumpkin.—Sow seed if a sufficiency has not already been sown.

Radish.—Sow seed from time to time to keep up a supply. This is well worth raising in the summer, but it will need moist rich soil to bring to perfection.

Rhubarb.—A little seed may be sown if plants are required for planting next winter or spring.

Sweet Potato.—If plants have been produced from cuttings plant them out whenever there is little or no probability of late frosts. Plant these in rows 4 feet apart, the rooted cuttings to stand 1 foot apart in the rows. They will soon grow if the weather is at all favourable, and produce a good crop. Sandy loam suits them well, but they succeed fairly in any ordinary garden soil provided it be worked well into a good condition before planting.

Spinach.—Sow a little seed.

Tomato.—Sow seed or plant seedlings to any extent. Train the plants as they grow, to stakes, wire-netting, trellises, brush, or anything that will support them. Watch for black spot on fruit, and should any be found, remove and burn the affected fruit.

Turnip.—Sow a little seed in drills.

Vegetable Marrow and *Squash.*—Sow seed if sufficient plants have not already been raised.

Flowers.

The chief work in the flower-garden will be the protection of many plants from the effects of summer heat, and should the weather prove dry, in supplying them with sufficient moisture to keep them in health. Weeds must be kept from growing and spreading about the garden, walks kept clean, hedges and edgings clipped and tidy, and grass mown and kept short.

The roses should still be flowering well and producing fine blooms, and if the seeds of the Teas and Hybrid teas are removed before they ripen, and the stem on which they grow is pruned back, new flowers will be produced in plenty. Some rather strong liquid manure, made by soaking horse, cow, sheep, or fowl droppings in water will assist the rose plants to make fresh growth and consequently fresh flowers.

Chrysanthemums may be planted, dahlias too may be planted and as these grow they can be trained into any form desired by pinching and pegging or tying out the shoots as they grow. The single, and also the cactus varieties of dahlias, produce the prettiest of flowers. Retain only one stem to each dahlia, and this can be trained as desired.

Sow and plant out balsams, zinnias, portulacas, coleus, cockscombs, including the brilliant-leaved amaranthus.

General Notes.

PRUNE CURING IN FRANCE.

IN curing prunes at Agen, in France, reports the *California Fruit Grower*, the fruit is allowed to fall to the ground of its accord until the end of the season, when those still on the trees are shaken down or gathered by hand. From this latter gathering it is expected to obtain only a second quality of prunes. After they are harvested the prunes are exposed to the sun for a day or two before being placed in the dryer.

The prunes are subjected to at least three successive cookings in the ordinary dryers. Each of these has a special object, and each must be conducted with great care. The first two cookings tend to evaporate slowly the water in the prunes. The third cooking is to complete the drying and give the fruit a varnished appearance, very highly prized by buyers. For the first cooking the heat is not allowed to rise higher than from 113 degrees to 122. In the second cooking the temperature is raised to from 140 degrees to 150, but must not be allowed to rise above 160 degrees. If during the first two cookings the heat rises too high, the prunes burst, the juice spreads on the outside of the fruit, becomes glutinous and flavourless, and the fruit is rejected by buyers. After each cooking the prunes are exposed to free air until they become cold, when they are given a general turning over on the trays and returned to the dryer. The prunes are on no account handled while warm, as touching them in that condition tends to make them glutinous and sticky.

The third cooking is done at a temperature of from 174 degrees to 194, and the heat is sometimes raised to 212 degrees. This cooking, as well as the preceding ones, requires the closest surveillance. The least excess of heat may puff the prunes and burn them.

The length of time of each of the three cookings is about six hours. The curing is considered finished when the fruit presents a firm and glossy skin, and when the flesh, under pressure of the thumb and finger, feels at the same time plastic, and finally when the kernel within the pit is cooked. Unless this last is accomplished the kernel ferments and moulds, and brings about in time an alteration in the character of the fruit, which results in decomposition.

It will be observed that the old process of working the fruit with thumb and finger between each cooking, which is so often mentioned as a part of the French process, is no longer followed. The prunes are simply rolled over on the trays after they have become cold.

When the prunes are sufficiently cured they are stored in bins until sold. The place where they are stored should be dry and airy, otherwise the fruit may take up moisture, especially if any of the prunes have not been sufficiently cured.

Attention is called to the fact that prunes, like other fruits with sweet and soft pulp, are extremely hygrometric (likely to absorb moisture), and therefore most subject to alteration of character. The degree of heat to which they are subjected in curing is not always as high as it ought to be. The methods followed in order to reduce as little as possible the size of the fruit in the curing process result in making the skin much drier than the interior of the fruit. In this case the skins strongly tend to attract moisture, and if exposed to damp air they soon become moist. When this is the case they must be at once returned to the dryer or the damage will be irreparable. The opening of the pores of the skin by moisture permits the entering of spores of different species. Myriads of microscopic insects also are soon found. It is, therefore, recommended that prunes, when thoroughly dried, be placed in elevated bins, which can be closed tight when the air is damp and opened and well aired when the atmosphere is dry.

THE PRINCIPLES OF PLOUGHING.

A POINT of primary importance in producing crops, says Andrew M. Soule, is correct ploughing. Too often we plough shallow. The roots of the plant are provided for the purpose of supporting it in the soil and of securing food. It is important, therefore, to plough our land to a depth of 10 inches in the course of time, and, if possible, subsoil to a depth of 4 or 5 inches more, in order that we may increase the feeding area of plant-roots and aid in the disintegration of plant food.

There are many types of ploughs. Some of these are very defective. A plough should have a long, overhanding mould board, so that the soil may be thrown high and given a sudden turn so it will be finely pulverised. The height and shape of the mould board do not increase the draft to the extent that is commonly thought. One of the best ploughs for inverting green crops and for thoroughly pulverising the soil is a disc plow.

The time to plough will be determined entirely by the condition of the soil. It is a mistake to plough the land when it turns up cloddy. It is better to wait until the land contains sufficient moisture to fine it as it falls from the mould-board. The soil is like a sponge—when filled with water the soil particles are expanded and all the interstices are filled. When left exposed to a hot sun the particles are drawn together by the rapid evaporation of the water. This explains why the soil cracks so badly in improperly drained fields.

This cracking tears and breaks many of the fibrous or feeding roots of the young plants, thus cutting off a portion of their food supply. If the drying is very rapid the particles of the soil are drawn into each other with such force as to be compacted into an almost solid mass, and it is very difficult to reduce it again to the consistency of a fine tilth. If the soil is full of water when ploughed, the particles do not slip by each other as they would do when containing a less amount of water; hence it becomes greasy and waxy, and the particles are grained into each other, so that it may take years to bring it to its former texture. The ability of a soil to hold water depends considerably on its structure. In soils newly broken the particles are large, and they dry out very readily because of the lack of capillary action.

It is necessary, therefore, after ploughing those soils to follow with a roller to firm the particles and press them together. As this treatment renews capillarity, and brings supplies of moisture from the lower areas to the surface, the rolling should be followed by the harrow, which breaks the contact of the soil-pores with the open air and holds the moisture and volatile forms of nitrogen in the soil; in fact the roller and harrow are indispensable factors in the conservation of soil-moisture in all cultivated crops of the farm. Shallow cultivation to the depth of 3 inches, once a week or oftener, is the best practice. In cases of drought it is sometimes necessary to roll to bring the moisture to the surface, and then follow with shallow cultivation.

It has often been noticed that a light shower helps a crop out of all proportion to the amount of rainfall. This is explained as follows:—When a soil is improperly cultivated, and a severe drought follows, the surface becomes dried out to the depth of 10 or 15 inches. The water-table sinks so low, and the surface tension is so weak, that no water is raised near the surface. When a light shower falls, the water percolates into the soil. If sufficient enters to re-establish the connection of the surface and subsoil-pores, the translocation of water towards the surface naturally follows. In other words, capillarity is renewed with the immediate surface, and the soil regains its power to lift water from below. After light showers, therefore, the land should be cultivated to prevent the loss of water brought to the surface by this process of translocation.

One of the best methods of giving life and fibre to our soils is by ploughing under green crops. As nearly all soils of dry districts are deficient in humus, because of character of indigenous vegetation and of the one-sided cropping generally pursued, it is important to supply them with nitrogen. It is also necessary to furnish them with vegetable matter so they may be more retentive of water. Vegetable matter ploughed under forms humates, and these combine and render available portions of the phosphoric acid and potash locked up in the soil. Then green crops give the desired mechanical texture to the soil. This cannot be secured by the use of the mineral forces of artificial fertilisers. Ordinary farm crops remove from 10s. to £1 worth of nitrogen per acre. It would be impossible for the farmer to make adequate returns to the land for the nitrogen removed on a cash basis. By the occasional incorporation of a green crop, however, he secures all the desirable characteristics that a good soil should possess, and he supplies his soil with nitrogen drawn from Nature's storehouse—the atmosphere.

ANNUAL REVIEW OF THE AUSTRALASIAN BUTTER TRADE.

In their annual review of the Australasian dairy industry, Messrs. Weddell & Co., of London, draw attention to several matters of importance to the New South Wales butter exporters. Taking bare figures, while New South Wales, during the period under review

(1899-1900) exported only 76,000 cwt. of butter, New Zealand and Victoria, where the export trade is under Government supervision, sent to England 150,000 cwt., and 252,000 cwt. respectively. Some years ago, the export of butter from Canada amounted to 18,000 cwt. in a year. Then the Dominion Government took the matter in hand, and under departmental control the trade has increased to 146,000 cwt. per annum.

Speaking of the wonderful development of dairying in Australia, Messrs. Weddell say: "The season (1899-1900) established two records, both of which are highly complimentary to the energy and enterprise of the Australasian dairy farmers, and must be particularly satisfactory after four seasons of drought. The first record is the remarkable fact that in eight months, ending 30th April last, nearly 25,000 tons of Australasian butter entered the United Kingdom, which exceeds the previous highest yearly record by 10,200 tons; and the second record is, that the increase of the season over its immediate predecessor was the enormous amount of 11,000 tons, which is nearly double the increase in any one year that any country in the world ever made." In other words, in spite of unfavourable seasons, the dairy industry of the colonies is expanding at such a rate as to pretty nearly double itself in a twelvemonth. Meanwhile, on all sides, new areas are being devoted to butter-producing in the enormous tracts of splendid country on the western tableland hitherto considered to be adapted only for sheep and wheat farming, so that the increase is far from spasmodic.

The matter of gravest concern to the producers and exporters of undeniably excellent butter is the inferior price it commands in London. Concerning this point, Messrs. Weddell & Co. state: "The choicest grade, undoubtedly, is worth more money that it realises; but the assertion of agents for many years that Australasian butter is specially suited for retailing at a shilling, has created a belief among buyers that a shilling is the proper retail price per ℔. for it. The 'choicest' grade, however, should be exempt from this prejudice, and, *if there was any properly organised butter committee to regulate the sale of Australasian Butter in British markets*, as there is of all other classes of butter, then 'choicest' brands should fetch a half-penny to a penny per ℔. more than they do now."

While this Department has never contended that pasteurisation can be substituted for sound pasturage and fodder, absolute cleanliness and proper manipulation, an effort has continuously been made to show that in a climate like this, and under conditions peculiar to a growing industry, the process is indispensable in conjunction with controlled fermentation to ensure the manufacture from mixed cream of butter of the first quality. Thus it is not surprising to see the following opinion expressed in Messrs. Weddell & Co.'s report:—"The art and science of butter-making by means of pasteurising the milk or cream, and then fermenting the cream by means of lactic acid bacteria, is not making rapid progress in the Australian Colonies generally; but in New South Wales a very great impetus has been given to this improved method by the almost universal success with which the Berry Central Butter Factory has carried off the chief prizes with pasteurised butter at the local and Royal Agricultural shows. The Dairy Commissioner for that Colony (Mr. M. A. O'Callaghan) has also devoted great attention to the matter, and his energy in assisting the movement has had considerable effect in its development, and it will be surprising if New South Wales does not soon displace Victoria from the premier position for Australian butter which that Colony has hitherto maintained."

In reference to the rapid advance of the Canadian butter trade, the Minister points out that this is confirmed by the United States Secretary for Agriculture, who, in deploring rapid falling away of their dairy export trade, says :—" Meanwhile, Canada is forging ahead, with Government supervision, and guarantee to assist, and securing for its creamery butter a firm hold in the British markets. The lack of some protection by Government certification of exports from this country is already causing butter shipments by way of Canada, as in the case of cheese, previously mentioned."

It is worthy of mention that while 37,500 tons of Colonial butter were exported to England last season, only 4,400 tons were sent from the United States. This seems remarkable in a way, because the United States farmer is usually right up in the front rank in any trade that can be won by the adoption of up-to-date methods; but it must be remembered that the trend of American butter production lies rather in catering for the local requirements of some seventy million people than in the development of an export trade. That is probably the reason why the States Government have not controlled, as they do in so many other products, the export of butter.

EXPORT OF GREEN PORK.

THERE are many difficulties in the way of establishing the much-desired export trade in Australian bacon. Other countries which have managed their export business at the other side of the world, instead of leaving their interests to the tender mercies of the agent-trader, as the Australian has done, have a firm hold of the markets. Unless we follow in the footsteps of Canada, and insist on authoritative supervision and proper representation abroad, we cannot hope to place any further export lines without heavy initial losses to the producers. While bad management allows the exploitation of the trade by all sorts of irresponsible middlemen, the producer cannot obtain a fair profit, and before his returns approach the profit stage, gives up the business in disgust. There are some lines which are more easily placed, and Mr. Sinclair, the Victorian representative in London, seems to think that Australia's opening for a porcine product will be found in green pork. He gave the following particulars in a recent report :—" The most favourable season for the Australian trade in fresh pork in England commences towards the end of August and continues till the close of March. Good prices are generally realised during the first fortnight, but from the second week in September to the end of October supplies, especially from Holland, are plentiful, causing an easier range of values.

December and January are the best months, the cold weather favouring the consumption of fresh pork. The size and weight of pigs suitable for the trade vary from 50 lb. to 80 lb., anything larger than the latter being regarded as excessive, and realising less value. Exporters in the United States, if shipping fresh pork for roasting or sausage-making, from animals between 80 lb. and 100 lb, do not send the hind legs, belly pieces, or fat. The rest of the pig, excepting the head, is cut into suitable sizes, covered with linen wrapper, and packed into neat, small pine cases, with openings in the ends and sides for the passage of cold air in the refrigerating chamber. All carcases under 80 lb. weight are sent entire. The pork, Mr. Sinclair adds, should not be too fat, the carcases, for which there is a demand, being well conditioned, but with plenty of lean meat. The first shipments from the United States were of over-sized animals, and the exporters lost money on them. Prices for American frozen pork in the London market range from 4d. to 5¼d. per lb., a probable average being 4½d." —*Australasian.*

COW-PEAS AND WHEAT IN ROTATION.

AN Illinois farmer, in reporting upon the means adopted to maintain the fertility of wheat-soils in his State, says that the growing of cow-peas is becoming well established. Every season farmers in possession of poor and worn land are paying more attention to cow-peas, and when rightly managed the results from such cropping are about as good as from a crop of clover, with the advantage, however, in favour of cow-peas that they can be grown in a very short time—often as a catch-crop—on soil too poor or impoverished to produce clover. The richer the soil the better the growth of peas, and the more nitrates and other forms of plant-food made available for future crops; yet on any poor soil they will thrive and make a great improvement. Not only is the fertility increased, but the mechanical condition of the soil is changed for the better, because the shading of the ground, smothering of weeds, and the boring down of the roots have a loosening and mellowing effect.

The disposition of the crop and after-treatment of the land determine the profitableness of introducing the cow-pea into regular rotation. It seems a pity to follow the cow-peas with a greedy grain crop, especially on poor land that needs to save what has been gained. If it could be followed up by other beneficial crops until there was more permanent improvement it would be far better for the land and the pocket of the owner; but the fact is, the land must generally be put through, and something that looks like returns secured. Theoretically, an ideal system to follow is to depasture the peas during autumn, and so get the land into good condition for wheat. But it is reported that crops of wheat are disappointing when this method of preparation is followed, not producing as well as if the same land had been ploughed early and put in in the usual manner. That, however, does not prove that the soil has not been improved in fertility, for the next crop will show marked improvement. One explanation is: the cow-pea is such a rank and rapid grower that it uses up the available plant-food in the soil, and when wheat follows directly after peas there is no immediately available supply to give the wheat a start. As the remains of the cow-pea plants begin to decay they will give up their plant-food, but not before.

Concerning his experience in Illinois, Mr. Shearer says:—"As usually managed here the pea-hay has been removed late, the land harrowed to produce a seedbed and wheat drilled in soon after. Had the hay crop been removed earlier, and the stubble ploughed under and rolled and pulverised a few weeks before seeding, I am confident the results would have been satisfactory; in fact, I know of a few fields treated in that manner, and they produced excellent crops of wheat. It stands to reason that on thin land where the fertility in the stems and roots is needed to aid the following crop, they must be partly decayed, or they are of no use, but are an injury by making the ground too loose. For this reason it is not desirable to plough under the whole crop; and besides, if ploughed under in hot weather, it is liable to hurt the soil by a too rapid fermentation, producing an acid condition. A rank growth of green weeds often injures the soil in the same way, and we wonder why it does not improve the land by ploughing under such a growth. If the entire crop of peas is wanted as a fertiliser, it is best to pasture it off in the fall, and let the dead vines remain on the ground over winter and put in corn."

FARMING IN GERMANY.

FROM a report obtained by the editor of the *American Agriculturist* on the conditions of farm-life in Germany, it appears that much of the farming there is done on a small scale by peasant proprietors or tenants, who live in little crowded villages and go out to work their land adjacent. There are no fences between the holdings. Women do much of the field work. Often a single cow, or a pair of poor cows that give but little milk, will be seen hitched to a waggon or plough. The young bullocks intended for beef are not worked, as it is found more profitable to give them every opportunity to produce prime meat which fetches a big price.

On the larger farms operations are conducted on a wholesale scale, but the life and work is much different from that of American or Australian farms. Hasselheck Farm, near Nauheim, in the province of Hesse, south-western Germany, is typical. The buildings are of stone or brick, in the form of a large hollow square, entrance to which is through huge gates, as of a castle. This arrangement comes down from feudal times, when a farmstead had to be a veritable castle for self-protection. The interior of the square is the barnyard, and the living rooms of the dwelling face it and are cut off from the beautiful views without—a sad loss. The yard is paved, with a lower part at one side into which drains all the liquid from house and stable. Here it is absorbed by the stable bedding, any remaining liquid being pumped into watering carts and spread on the crops. The cow stables and swine houses are kept immaculately clean with lime wash. Cows are curried like horses, and are even cleaner. The tuberculin test is compulsory, but is done by the State without expense to the farmer. "Tuberculin tested" is advertised on all milk waggons. The legal standard for milk is 2·7 per cent. fat only. Of course many of the German dairies average higher than this figure.

A German Dairy Farm.—At Hasselheck homestead the seventy cows are mostly Holsteins, a few Simmenthals and Swiss. The milk contains 3·5 to 4 per cent. fat. Milking is done at 2 a.m., 10 a.m., and 4·30 p.m. A foreman and two helpers do nothing but milk and take care of the cows. One dairymaid cares for all the milk—1,000 quarts daily. It is run over a cooler, like a Lawrence cooler, with cold water running through the interior, thus aerating and cooling the milk at one operation. The milk is then put in cans or bottles and sent directly to the consumer. The cows give 15 to 30 quarts milk daily. A cow that averages less than 10 or 12 quarts daily for six or nine months is turned for beef. A cow must bring in £18 to £25 a year gross in order to yield a profit. Consumers pay 2½d. per quart for milk from cans, 3½d. for milk in sealed bottles. All the fodder for the stock is raised on the farm, but considerable fine feed is bought. Oat bran and wheat bran are mixed with wet brewers' grains and cheap molasses from a beet sugar factory, put in a silo, and each cow gets about 15 lb. daily of this mixture, besides green feed and straw in summer and dry fodder in winter. The cows have no pasture, but exercise for two hours each morning in the yard. In summer, lucerne, cut two or three times per season, is fed green to the cows in stables, also red clover, and other green stuff. Maize is beginning to be grown for autumn feeding. On this particular farm there was nothing in the shape of farm buildings that appeared striking to one accustomed to the lavish American ideas on the matter. The most striking feature was a separate drinking trough, covered, and fed by running spring water; so that if one cow has tuberculosis she cannot give it to her neighbour through the water.

Pigs.—The pigs kept are Small Yorkshires, fed on hotel and distillery swill, barley and maize meal, and are sold at six to eight months old, when they dress 200 to 250 lb.

Potatoes for Distillation.—Huge quantities of potatoes are grown on farms for manufacture into alcohol, the distillery waste being a valuable fodder for stock. Where this work is carried out on a farm the plant is pretty elaborate, and the spirit is distilled under Government supervision. 1,000 lb. of potatoes yield about 18 gallons of alcohol. The practice is popular, inasmuch as this means of disposing of the crop is very profitable, and affords winter occupation for a large number of persons.

Soil and Treatment.—The soil of the Hasselheck farm is a strong red-clayey loam, quite heavy. To produce good returns it has to be liberally fed. Stable and barnyard manures produced on the place are used. Readily prepared chemical fertilisers are not employed, but large quantities of manurial chemicals are bought for direct application and treatment on the farm. Large quantities of Thomas Phosphate are used, an average dressing being 600 lb. per acre, with 1 ton of lime every sixth year. High-grade potash salts, containing 48 to 50 per cent. potash, are freely used also, potatoes getting 150 to 200 lb. of it per acre, and grain crops 30 to 40 lb. Wheat also receives a top dressing in spring of 20 to 30 lb. nitrate of soda, to furnish nitrogen for a quick growth; but nitrogen is not used in other crops. The ploughing under of clover and lucerne stubble is relied upon to furnish nitrogen from the air, and the lime helps to set free for plants the otherwise inert nitrogen in the soil.

Amount of Help Employed.—This farm of 600 acres under the plough and a couple of hundred acres of woodland, employs forty men in summer and twenty in winter. These hands are nearly all boarded in the farmhouse, where everything consumed is raised on the farm, including wheat. The fare is coarse, easily cooked, but healthy. The housewife and two maids do all the housework. The husband and owner does little manual work, but occupies himself directing affairs, marketing the produce, &c. Two competent foremen attend to the routine of the farm-work.

Compared with the United States or Australian farmer with a similar area of land, the German has a much better time and more leisure; but his wife has many more responsibilities and much harder work all the year round than is customary for country womenfolk in newer countries. Life is not so tense in Germany, either on big farms or little ones, as in America and the Colonies. There always seems to be time enough and to spare, while field-labour is so cheap that it almost seems to be a question as to how many people can possibly be employed than how few.

The small farmer in Germany is certainly not overburdened with riches; but there is more social life in the farm-village system than is possible where farms range over a wider area and thus become practically isolated.

MUSTARD FOR SHEEP FEED.

THREE or four decades ago, when wheat-growing was far more popular than it has been recently, writes "J.D." in the English *Agricultural Gazette*, the growth of mustard was much recommended as a quick-growing green crop, which, if sown in June or July, after the fallows had been cleaned intended for wheat, would produce an abundance of greenstuff to be ploughed into the land, and supply a considerable quantity of manure for the corn crop. Moreover, it was thought good management in some districts to plough in two crops of mustard in the fallow year, and depend almost entirely on this for the manuring of the wheat crop.

But both fallows and wheat crops have gone very much out of fashion during the past twenty years, yet more mustard is grown than ever. A far better use has been found for it than to serve for green manuring, having been found to serve well as an autumn fodder crop for sheep to be fed off on the land. For sixty years or more it has been utilised thus on the lighter soils of the southern half of the kingdom, because it can be grown quickly and without much manuring or expense, but it was never in the old days appreciated very highly for the nutriment afforded. The old farmers thought it merely filled the stomachs of the sheep, and was useful to fall back upon when other green food was wanting. Thus, after a droughty summer, it fills up the vacuum of there being few early turnips for autumn consumption. As mustard will come ready to feed in about seven weeks after being sown, sheep owners finding themselves possessed of a few turnips at the latter end of July, naturally sow mustard to have a supply of green food for their flocks in October. On soils easily worked to a fine tilth wheat stubbles have often been ploughed immediately after harvest, and cropped to mustard, with the result of considerable quantities of keep being produced for consumption late in autumn. But mustard will not stand severe frost, even after being fully matured; so that all the crop standing on the land unconsumed will be sure to be cut down and killed by the first touch of wintry severity in November. Flocks of sheep have often been well supported on mustard up to the middle of that month, but seldom long afterwards.

As to the merit of mustard as a fodder crop, it stands by no means so high as rape, kale, cabbage, or even common turnips, but it forms very healthful feeding. Sheep are seldom seen to scour while getting their living entirely or mostly by it, and apparently they are fond of mustard, for the waste left when a crop is being consumed is much less than from many other kinds of green produce. Next to its chief recommendation of being the quickest green crop possible to be raised in summer and autumn in cases of grave emergency, it is greatly valued by occupiers of soils subject to wireworm ravages, owing to it having been found that not only are the roots of mustard distasteful to the diminutive worms which form the pest, but that the growth of mustard seems sufficiently destructive to them as to render the land freer of the pest than before.

If fed off before, or even during the blooming stages, the amount of nutriment extracted from the soil would be very slight indeed. Like many other catch crops, it leaves the land much richer than it found it, even although no manure whatever was put in with the seed, if fed off by sheep. On poor soils, to stimulate the growth with 2 cwt. or 3 cwt. of superphosphate drilled underneath the seed may be strictly advisable, but on richer lands, well up in condition, this is seldom done, and where the surface is worked to fine tilth, and the seed sown broadcast and covered by a light pair of harrows, the crop costs very little indeed. Owing to this and the fact that its growth seems destructive to wireworm, some farmers sow it in spring to serve as a catch crop. The occupiers of chalk soils would appear to value it most, and in some few cases, where they have not required the feed at the time it was ripe for that purpose, they have mixed the green crop with aftermath, or something else, to form an ensilage stack. Far better would it be to utilise it in that way than to plough the produce into the land as green manure. The question may be asked: Would it serve to be placed into an ensilage stack alone? And if so, seeing how short farmers often are of succulent food for stock in winter, would it not be worth while to grow it more extensively to serve that object?

Replies to Correspondents.

Starch from Choko Roots.

MRS. GEO. SHEPHERD, of Coff's Harbour, has submitted a sample of a product manufactured from the root of choko. The vine, after bearing for two years, was dug up and found to possess large tubers, which were treated in the same way as arrowroot.

The chemist, Mr. F. A. Guthrie, reports: "This is an excellent sample of starch, and should be suitable for all the purposes for which arrowroot, or other starch, is used. The microscope shows that the product belongs to the group of starches represented by potato or canna starch, and is readily distinguishable from the arrowroots of commerce."

The So-called Shiver Weed.

FROM Scone specimens of the weed *Stachys arvensis*, commonly called shiver weed, were received for identification, and accompanied by a request for information as to whether the plant is injurious to stock.

The Assistant Government Botanist, Mr. E. Betche, says the plant is supposed to cause "shivers" in horses, but probably erroneously so. It seems very unlikely that a plant common in Europe, and regarded there in all countries as harmless, should prove to be poisonous in Australia. Mr. E. Stanley, F.R.C.V.S., Chief Veterinary Inspector, in his article on "Tremors in Horses, Cattle, and Sheep," *Agricultural Gazette*, Vol. VI., p. 32, 1895, says: "It is interesting and important to note that this disease is generally attributed to animals eating the hedge nettle (*Stachys arvensis*), but I see no foundation for such a belief. It is merely a coincidence that this weed flourishes at the same season, in the same pasture, at the time this disease is prevalent. It also flourishes, and is eaten by numberless animals, in thousands of places where the disease has never been heard of. The weed has no medicinal properties, and belongs to a very innocent family, Labiatæ, which includes mint, thyme, sage, marjoram, rosemary, &c. In consequence of its ill-repute, I have experimented by procuring hay, and also green weed direct from infected districts, and fed four working horses almost exclusively on the weed for about three weeks, trying them very severely with work at frequent intervals during that time, and for a fortnight afterwards, without any indication of the disease 'shivers.' Two of the animals lost flesh, one distinctly gained, and the other suffered no inconvenience."

AGRICULTURAL SOCIETIES' SHOWS, 1900.

Society.	Secretary.	Date.
Lithgow Agricul., Horticul., and Produce Society	M. Asher	Feb. 15, 16
Ulladulla A. and H. Association	C. A. Cork	,, 21, 22
Tumut Agricultural and Pastoral Association	M. McNamara	,, 21, 22
Central Richmond River Agricultural Society	D. Cameron	,, 22, 23
Cobargo A., P., and H. Society	T. Kennelly	Mar. 1, 2
Robertson Agricultural Society	R. E. Ferguson	,, 1, 2
Berrigan A. and H. Society	R. Drummond	,, 7
Canowindra P., A., and H. Association	A. E. Smith	,, 7
Tenterfield I. P., A., and M. Society, Show	T. W. Hoskin	,, 6, 7, 8
,, ,, Fair days	,,	,, 9, 10
Candelo A. Association	C. H. Brooks	,, 7, 8
Campbelltown A., H., and I. Society	A. R. Payten	,, 7, 8
Walcha Pastoral and Agricultural Association	F. Townshend	,, 8, 9
Oberon A., H., and P. Association	Alf. Gale	,, 8, 9
PortMacquarie and Hastings District A. and H. Society	J. Y. Butler	,, 8, 9
Berrima District A., H., and I. Society (Moss Vale)	James Yeo	,, 8, 9, 10
Campbelltown A., H., and I. Society	A. R. Payten	,, 9, 10
Lismore A. and I. Society	T. W. Hewitt	,, 7, 8
Cudal A. and P. Society	C. Schramme	,, 14
Bega A., P., and H. Society	J. Underhill	,, 14, 15
Central New England (Glen Innes) P. and A. Assoc.	John Priest	,, 14, 15, 16
Nepean District A., H., and I. Society	E. K. Waldron	,, 14, 15, 16
Macleay (Kempsey) A., H., and I. Association	E. Weeks	,, 14, 15, 16
Goulburn A., P., and H. Society	J. J. Roberts	,, 15, 16
Cumnock P., A., and H. Association	W. L. Ross	,, 20, 21
Bombala Exhibition Society	R. H. Cook	,, 20, 21
Armidale and New England P., A., and H. Association	W. H. Allingham	,, 20, 21, 22
Mudgee Agricultural Society	J. M. Cox	,, 21, 22, 23
Inverell A. and P. Society	J. McGregor	,, 21, 22, 23
Camden A., H., and I. Society	C. A. Thompson	,, 21, 22, 23
Crookwell P. and A. Association	J. W. P. Levy	,, 22, 23
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28, 29
Clarence P. and A. Society (Grafton)	J. C. Wilcox	,, 28, 29
Blayney A. and P. Association	H. Woolley	,, 28, 29
Gundagai P., A., H., and I. Society	A. Elworthy	,, 29, 30
Lower Clarence (Maclean) Agricultural Society	Geo. Davis	April 3, 4
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 4, 5
Cooma P. and A. Association	C. J. Walmsley	,, 4, 5
Upper Hunter (Muswellbrook) P. and A. Association	J. C. Luscombe	... *
Orange A. and P. Association	W. Tanner, junr.	April 4, 5, 6
Warialda P. and A. Association	W. B. Geddes	,, 4, 5
Royal Agricultural Society of New South Wales (Sydney)	F. Webster	,, 11-21
Rylstone H. and A. Society	W. Taylor	,, 25, 26
Bathurst A., H., and P. Association	W. G. Thompson	,, 25, 26, 27
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	,, 25, 26, 27
Wellington P. and A. Society	James Thompson	May 2, 3
Moree P. and A. Society	S. L. Cohen	,, 2, 3, 4
Upper Manning A. and H. Association, Wingham	Wm. Dimond	,, 3, 4
Durham (Dungog) A. and H. Association	C. E. Grant	,, 9, 10
Richmond River A., H., and P. Society (Casino)	Jas. T. Tandy	,, 10, 11
Hawkesbury District A. Association (Richmond)	C. S. Guest	,, 10, 11, 12
Gunnedah P., A., and H. Association	J. H. King	May 15, 16, 17
Nyngan A. and P. Society	J. C. Cahill	,, 16, 17
Coonamble P. and A. Association	F. C. Lamotte	,, 23, 24
Deniliquin P. and A. Society	H. J. Wooldridge	July 19, 20†
Wentworth P. A., and I. Society	J. W. Thorn	,, 18
Riverina P. and A. Association (Jerilderie)	Wm. Elliott	,, 24, 25
Hay P. and A. Society	G. S. Camden	,, 25, 26
Condobolin P and A. Association	D. H. Tasker	,, 25, 26
Balranald P. and A. Society	— Murray	Aug. 1
Forbes P. A. and H. Association	N. A. Read	,, 1, 2
Parkes P. and A. Association	G. W. Scaborn	,, 8, 9
Lachlan Pastoral and Agricultural Association (Hillston)	Thos. Cadell	,, 10
Corowa P. A. and H. Society	E. L. Archer	,, 14, 15
Gunnedah P. A., and H. Association	J. H. King	,, 21, 22

Society.	Secretary.	Date.
Cootamundra A., P., H., and I. Association	Thos. Williams	Aug. 28, 29, 30
Northern Agricultural Association, Singleton	Ch. Poppenhagen	,, 29, 30, 31
Murrumbidgee P. and A. Association (Wagga Wagga)	R. E. Shorter	Sept. 5, 6
Grenfell P., A., and H. Association	Geo. Cousins	,, 5, 6
Manildra P. and A. Association	G. W. Griffith	,, 5
Albury and Border P., A., and H. Society	Geo. E. Mackay	,, 12, 13
Burrangong P. and A. Association (Young)	Geo. Ward	,, 12, 13
Yass P. and A. Association	F. C. Mackintosh	,, 13, 14
Moama A. and P. Association	C. L. Blair	,, 19
Cowra P., A., and H. Association	H. Smith	,, 19, 20
Junee P., A., and I. Association	G. W. Scrivener	,, 19, 20
Burrowa P., A., and H. Association	Fred. H. Trout	,, 21, 22
Millthorpe Agricultural Association	S. C. Francis	,, 25, 26§
Temora P., A., H., and I. Association	W. H. Tubman	,, 26, 27
Germanton P. A. and H. Society	G. T. S. Wilson	,, 26, 27
Namoi P., A., and H. Association (Narrabri)	J. Riddle	Oct. 10, 11
Tweed, Brunswick, and Border P. and A. Society (Murwillumbah)	R. Campbell	Nov. 28, 29

1901.

Society.	Secretary.	Date.
Dapto A. and H. Society	A. B. Chippindall	Jan. 9, 10
Berry Agricultural Society	A. J. Colley	,, 22, 23, 24
Wollongong A. and I. Association	J. A. Beatson	Jan. 31, Feb. 1, 2
Kiama A. Association	Jas. Somerville	,, 26, 28
Shoalhaven A. and H. Society	R. Leeming	Feb. 13, 14
Lithgow A., H., and P. Society	M. Asher	,, 6, 7
Liverpool A., H., and T. Society	A. Mullett	,, 13, 14
Moruya A. and P. Society	John Jeffery	,, 13, 14
Central Richmond River Agricultural Society (Coraki)	D. Cameron	,, 13, 14
Manning River A. and H. Association	S. Whitbread	,, 14, 15
Alstonville Agricultural Society	Henry R. Elvery	,, 26, 27
Armidale and New England P., A., and H. Association	W. H. Allingham	Feb. 27, 28, Mar. 1
Tumut Agricultural and Pastoral Association	Bland Clayton	,, 27, 28
Robertson A. and H. Society	R. Ferguson	Feb. 28, Mar. 1
Tenterfield Intercolonial, P., A., and M. Society	F. W. Hoskin	Mar. 5, 6, 7‡
Boga A. P. and H. Society	John Underhill	,, 6, 7
Oberon A. Society	Alfred Gale	,, 7, 8
Berrima District A., H., and I Society (Moss Vale)	Jas. Yeo	,, 7, 8, 9
Lismore A. and I. Society	T. M. Hewitt	,, 12, 13
Central New England (Glen Innes) P. and A. Assoc.	Geo. A. Priest	,, 12, 13, 14
Goulburn A. and H. Society	J. J. Roberts	,, 14, 15
Clarence P. and A. Society (Grafton)	J. C. Wilcox	,, 20, 21
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Inverell P. and A. Association	T. P. Borthwick	,, 20, 21, 22
Crookwell P. and A. Association	M. P. Levy	,, 21, 22
Port Macquarie and Hastings District (Port Macquarie)	J. Y. Butler	,, 21, 22
Warialda P. and A. Society	W. B. Geddes	,, 27, 28
Mudgee Agricultural Society	Joseph M. Cox	,, 20, 21, 22
Lower Clarence A. Society (Maclean)	Geo. Davies	,, 26, 27
Castle Hill and District A. and H. Association	F. H. G. Rogers	,, 27, 28
Liverpool Plains P., A., and H. Association (Tamworth)	J. R. Wood	,, 27, 28
Upper Hunter P. and A. Association (Muswellbrook)	J. C. Luscombe	,, 27, 28, 29
Royal Agricultural Society (Sydney)	F. Webster	April 3, 10‖
Hunter River A. and H. Association (West Maitland)	W. C. Quinton	,, 17, 18, 19
Namoi P. A. and H. Association (Narrabri)	J. Riddle	,, 24, 25
Macleay A., H., and I. Association	E. Weeks	,, 24, 25, 26
Orange A. and P. Association	W. Tanner, jun.	,, 25, 26
Durham A. and H. Association (Dungog)	Chas. E. Grant	May 1, 2
Burragorang P. and A. Society (Young)	Geo. Ward	Sept. 11, 12
Yass P. and A. Association	F. C. Macintosh	,, 12, 13

* Show postponed till 1901. † Sheep Dog Trial, 23 May. ‡ Fair Days, March 8 9.
§ Show and Intercolonial Champion Ploughing. ‖ Entries close 6 March, 1901.

[8 plates.]

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Vol. XI. Part 12. *DECEMBER.*

Olive Culture.

(Continued from page 1022.)

W. J. ALLEN.

Failure of Olive Orchards.

In many parts of the world olive orchards have been planted which have never returned much more than sufficient to pay their way. In some instances failure was due to the absence of carefully applied skill, and not always to soil, climate, poor varieties, &c. It is as well for the intending planter to keep in mind, at time of planting, the fact that good varieties, good soil, the sun, and the application of knowledge and care will land him on the high road to success.

There are many causes why this fruit has so often proved a failure; and the following may be classed among those which are most common, viz.:—A lack of knowledge in planting the tree; planting varieties which are not suitable to the district, as well as unfruitful kinds; planting varieties which are not good for oil production; ravages of the black scale; loss of crops by the application of sprays which weaken and in many instances destroy the fruit buds, either through the solution being too strong or being applied at the wrong time.

We must, however, by either spraying or fumigating, endeavour to keep the scale in check, or otherwise we cannot expect the trees to produce fruit in paying quantities. Once the tree becomes infested with black scale the smut produced from the excrement of this insect will cover the leaves and branches, and the tendency will then be to leaf-growth instead of fruit; while the chances are that the tree will neither grow nor bear fruit, and will be valueless. Trees require to be kept in as clean and thrifty condition as possible and when necessary receive an application of proper fertilisers.

In addition to the causes above cited, the following are quoted from a report on the California olive industry made by the State Board of Horticulture, viz.:—

> Unsuitable soil, not naturally well drained, having a stratum of "hard-pan" or clayey; uncongenial conditions for roots too close to the surface. Soil not of ample richness; situation of too high or too low altitude.
>
> 2. Planting on sites too much exposed, without giving the trees protection by planting others to serve as breakwinds, &c.
>
> 3. The existence of a frost line. Frost during blooming period is very detrimental to the setting of the fruit, and in the fall and early winter to the fruit, especially during its tender period or first stages of ripening.
>
> 4. Planting varieties of indiscriminate selection, without regard to locality, adaptability, or the suitableness of stocks used, &c.
>
> 5. Planting trees too deep or too shallow, which everywhere has proved a great mistake.

6. Planting too close. Trees, after becoming large, require abundance of soil, of which there is not enough for the roots of all; also, the shade from adjoining trees is very detrimental.

7. Lack of fertilisers—failing to supply the elements of nutrition needed to secure healthy growth of trees that the particular soil may lack, whether in a virgin state or after the growth of trees has exhausted same.

8. Want of proper pruning, such as the trees may need under varying conditions, especially to encourage fruit-bearing wood.

9. Injudicious cultivation, such as cutting the fibrous roots just before a dry spell, or during blooming time.

10. Want of cultivation. Allowing the weeds to grow when the tree roots should have the soil to themselves, especially in dry weather, or allowing the soil to become dry after ploughing, without breaking up the clods and pulverising the ground.

11. Endeavouring to get two or more crops out of the same ground by growing other plants between and more or less close to the trees, which is detrimental to both.

12. Allowing the trees to become infested with the black scale, the fungus produced by the excrement of which clogs up the breathing functions of the tree and retards the growth of both tree and fruit.

Varieties.

The following are a few of the varieties growing in our Government orchard at Wagga. In the illustrations the natural size of the fruit and of the pits of each variety is shown:—

1. *Amellau.*—Tree of medium size; promises to be a good bearer; fruit large, suitable for pickling; ripens early. [Plate I.]

2. *Blanquette.*—A good-sized olive, with small pit; is only bearing fairly well, but the tree is small yet. [Plate I.]

3. *Regalis.*—Tree said to attain only medium size; fruit medium to large; bears well, but of no value for oil; suitable for pickling; ripened 21st May. [Plate I.]

4. *Macrocarpa.*—Tree said to be generally of dwarf habit, and shy bearer; is fruiting well at this orchard; fruit very large, and only suitable for pickling; ripened 1st May; very poor oil producer. [Pl. II.]

5. *Salonica.*—Tree said to attain only medium size; shy bearer; fruit medium size; is said to be fairly rich in oil; we have not tested it as yet. [Plate II.]

6. *Atro-Rubens.*—Fruit a little below medium size; tree vigorous grower; is said to be fairly rich in oil; has not been tested yet. [Pl. II.]

7. *Columella.*—A good sized olive; bears in clusters; promises well; has not been tested yet for oil producing quality; ripens latter part of April. [Plate III.]

8. *Bouquettier.*—Fruit medium to small; bearing heavily; ripens evenly, about 23rd April; one of the very best olives to plant for oil, yielding from four to eight times as much as many other varieties under similar conditions. [Plate III.]

9. *Arecluzzo.*—Fruit medium sized, roundish; promises very well in this district, but cannot say whether it would be worth a place in the orchard until I have had it tested as to its merits as an oil-producing variety. [Plate III.]

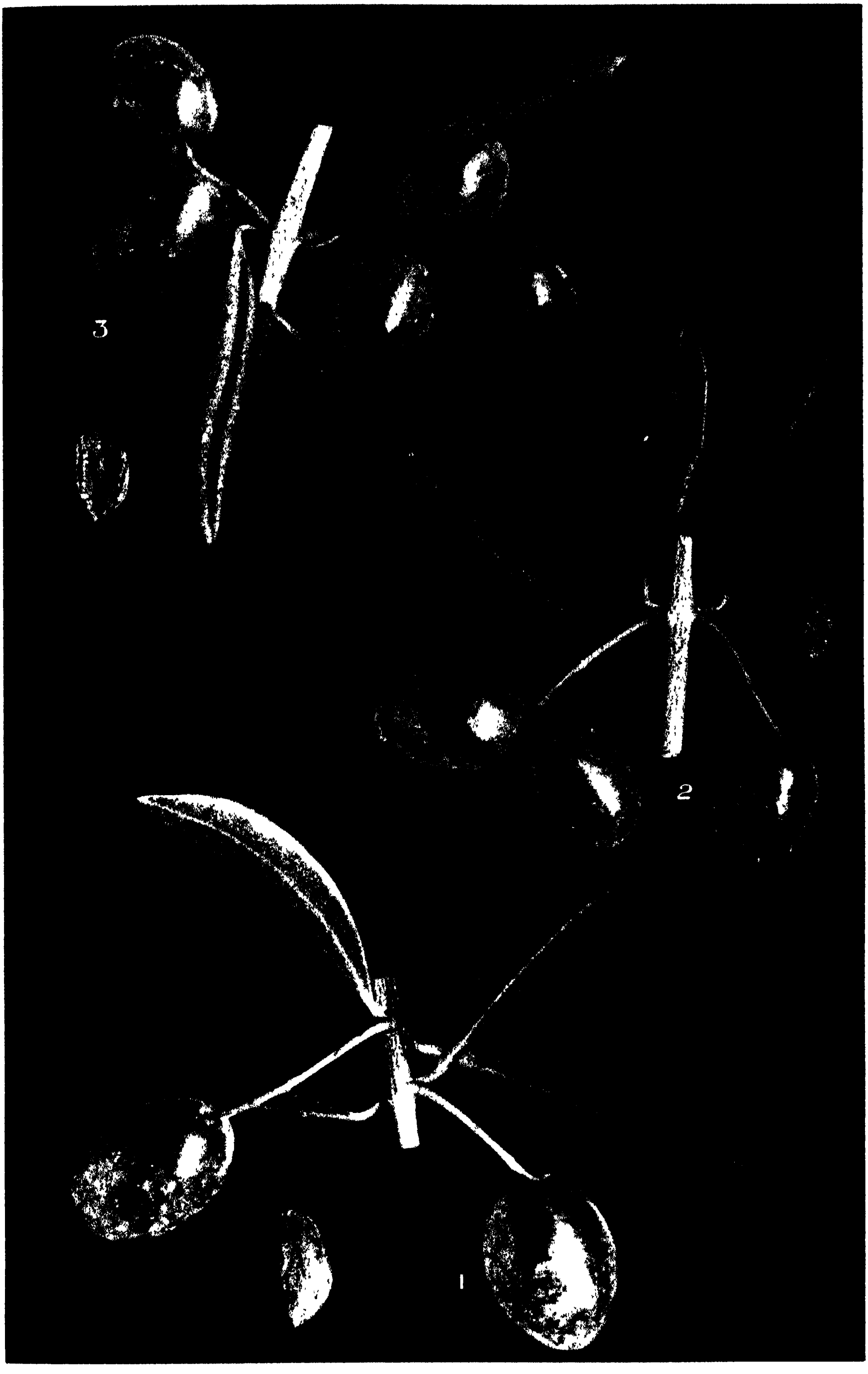


PLATE I.

OLIVES GROWN AT WAGGA EXPERIMENT ORCHARD.

1. Amellau. 2. Blanquette. 3. Regalis.

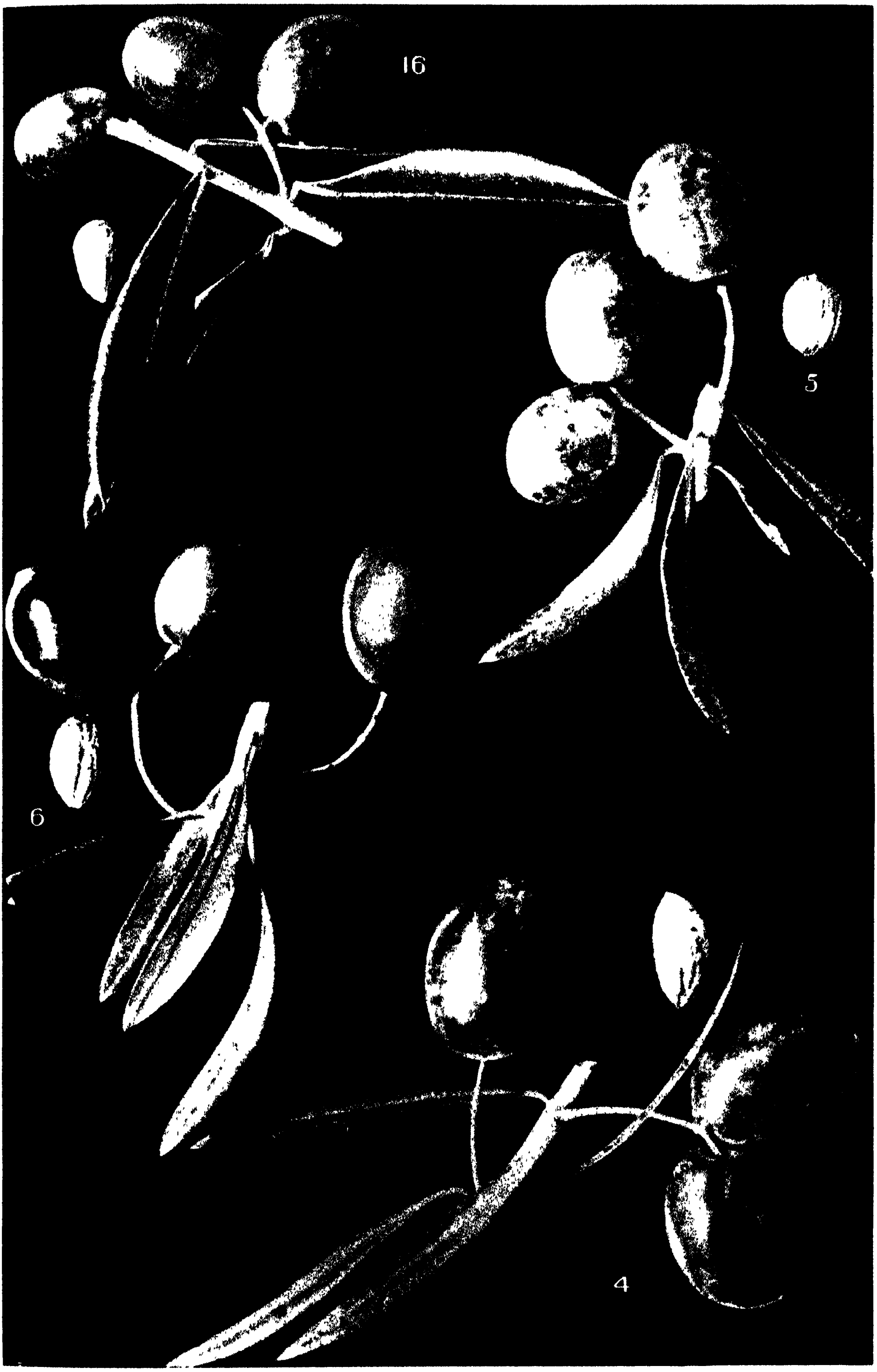


PLATE II.

Olives grown at Wagga Experiment Orchard.

4 Macrocarpa 5 Salonica 6. Atro Rubens

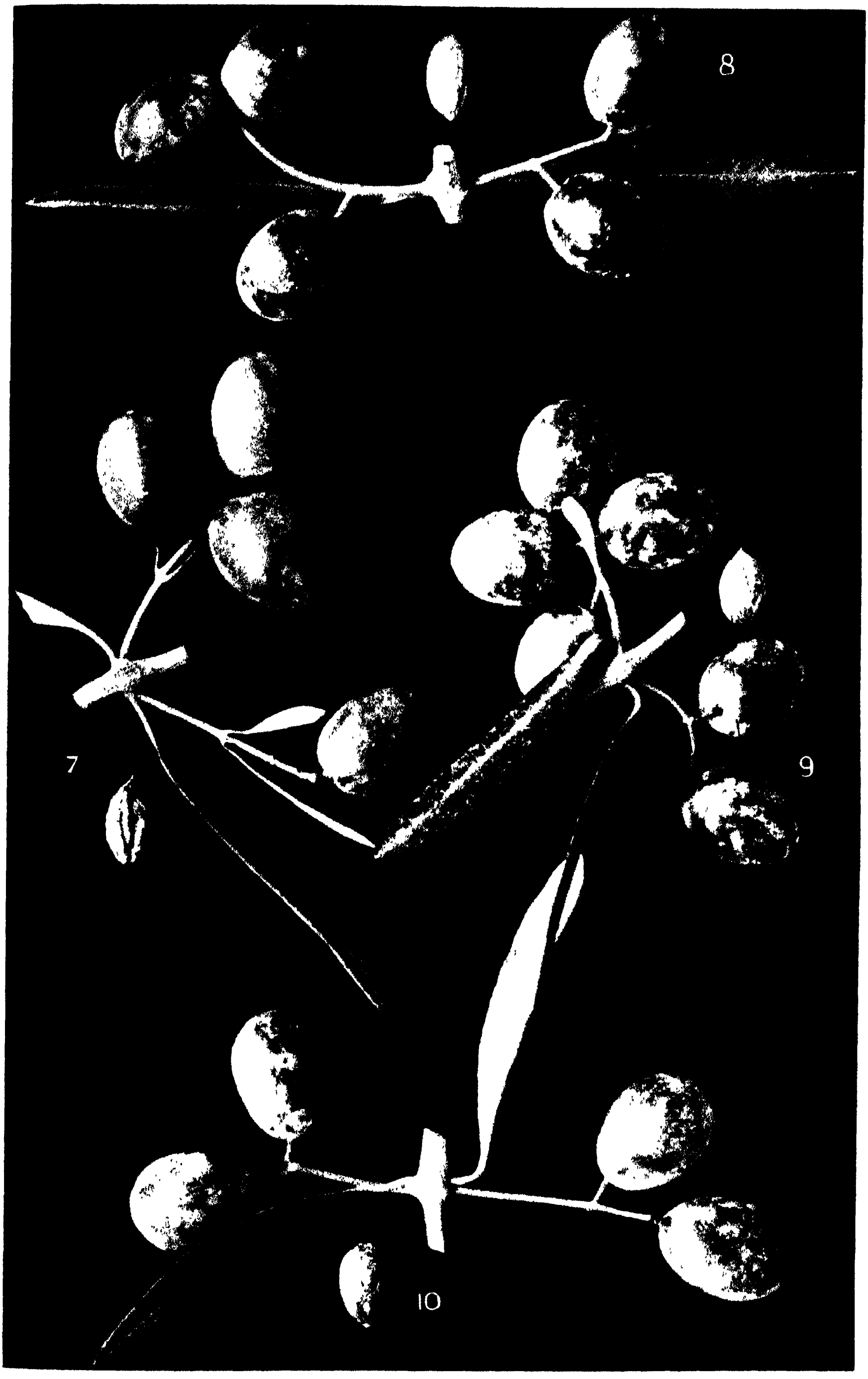


PLATE III.

Olives grown at Wagga Experiment Orchard.

7. Columella 8. Bouquettier. 9. Areeluzzo 10 Ragiola.

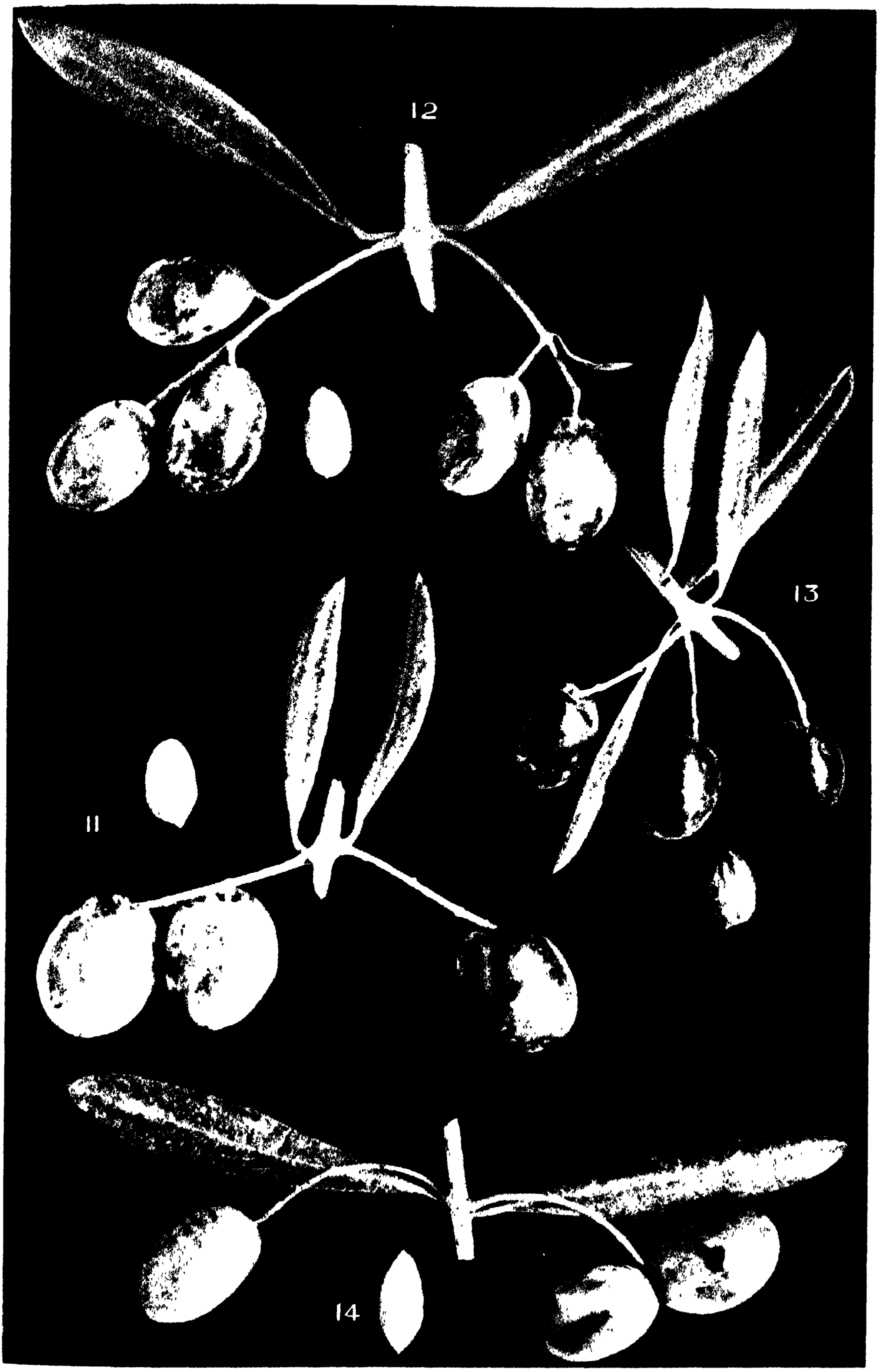


PLATE IV.

Olives grown at Wagga Experiment Orchard.

11 Manzanillo. 12. Columbaro. 13 Dr. Fiaschi. 14 Oblonga.

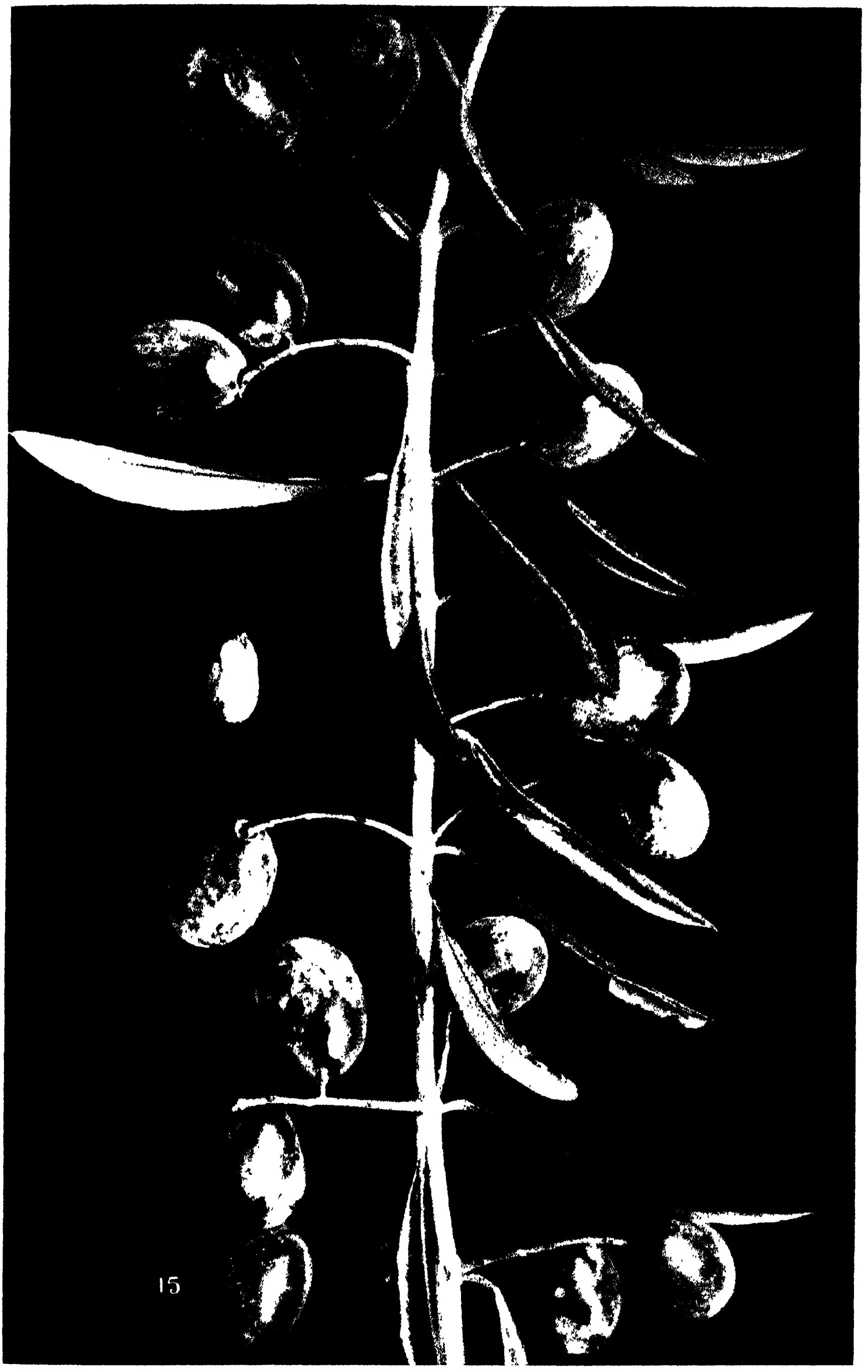


PLATE V.

OLIVES GROWN AT WAGGA EXPERIMENT ORCHARD.

15. Correggiola

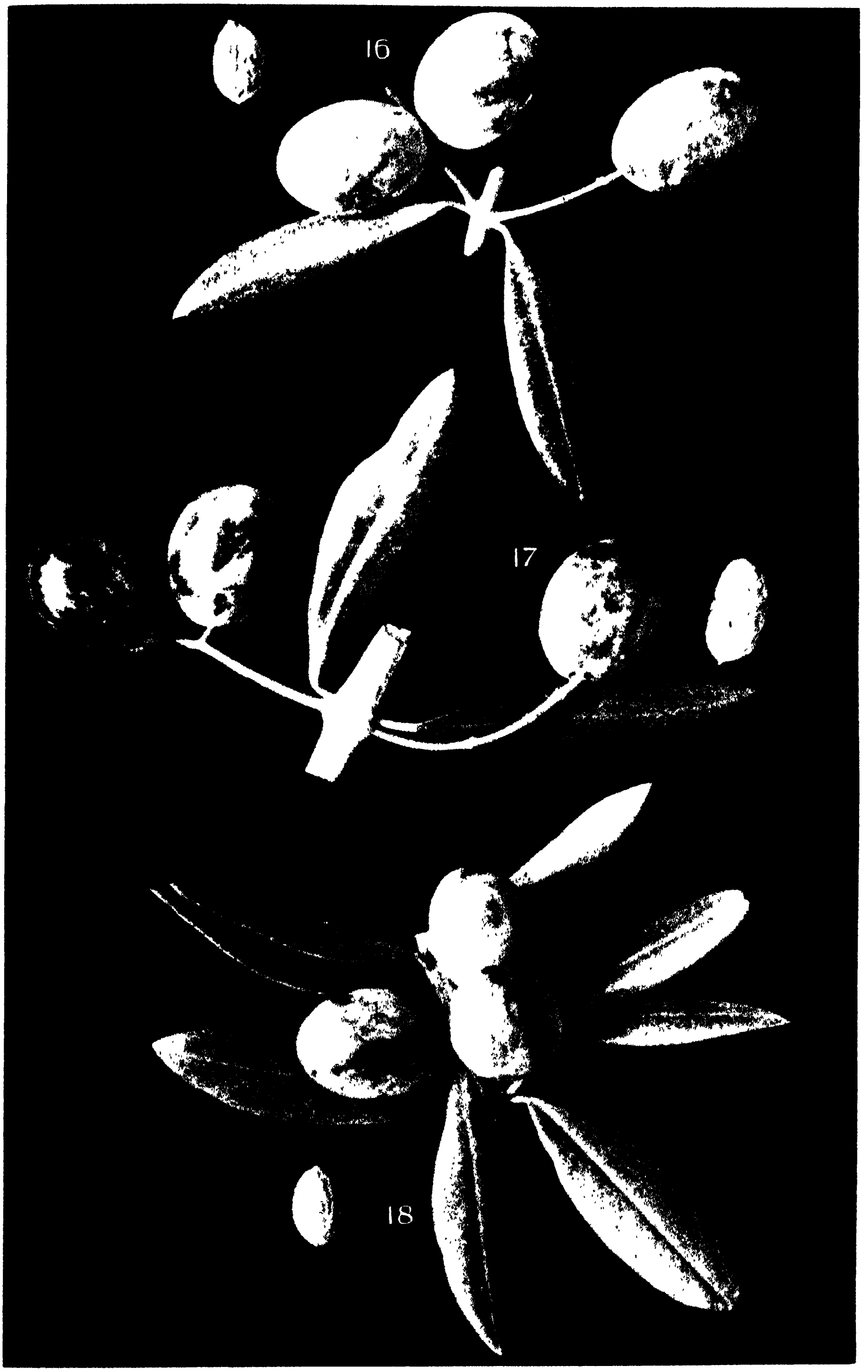
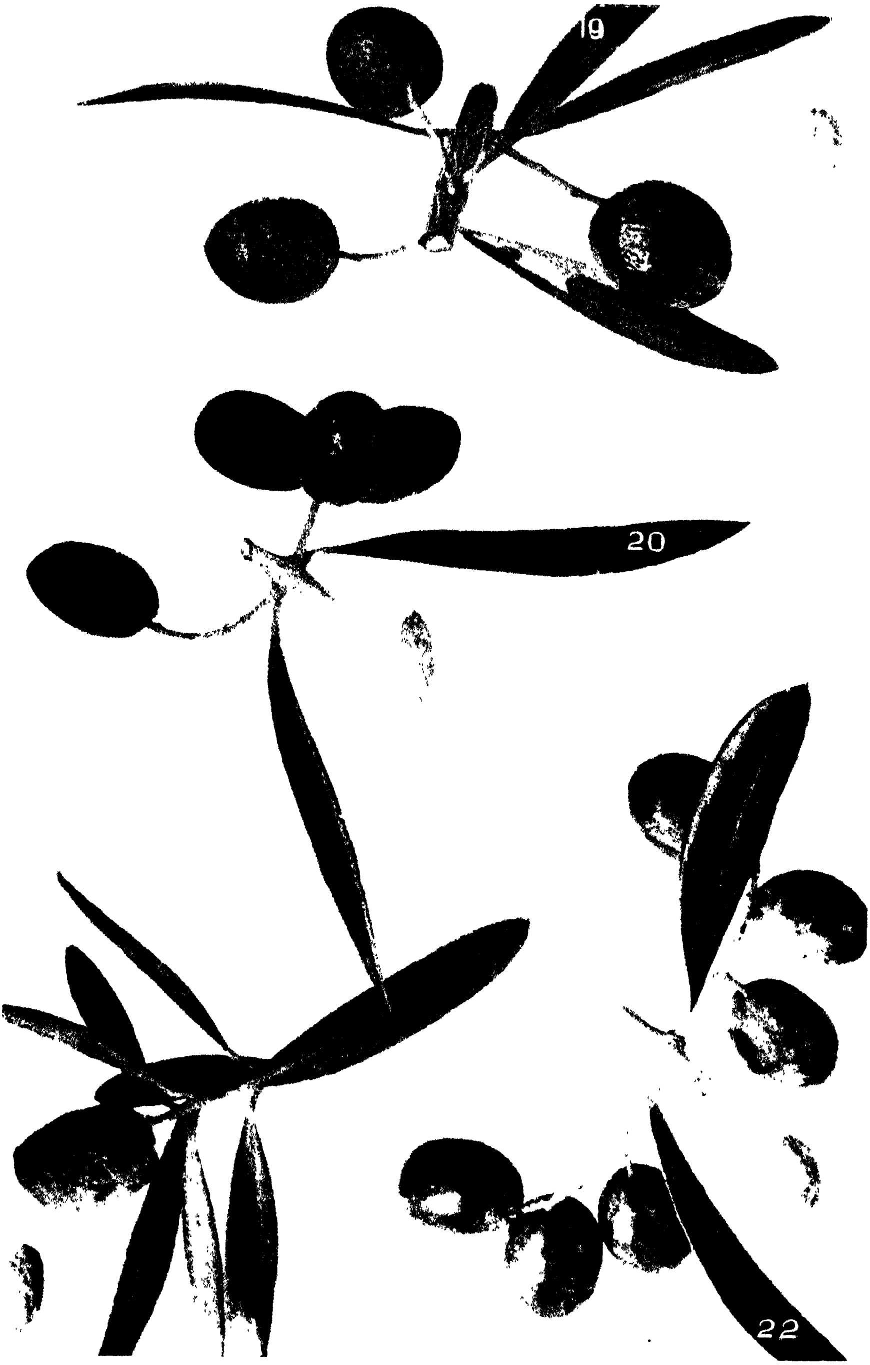


PLATE VI.

OLIVES GROWN AT WAGGA EXPERIMENT ORCHARD.

16. Pendulina. 17 Bella di Spagna 18. Regati



OLIVES GROWN AT WAGGA EXPERIMENT ORCHARD

19. Verdale. 20 Atro Violacea 21. Gros Redondal 22. Boutillon.

10. *Ragialo.*—Fruit medium to large; the tree bore only a medium crop this year; is only a second-class oil-producing variety in this district; therefore, not worth planting, as it is too small for pickling; ripened 24th April. [Plate III.]

11. *Manzanillo.*—Fruit medium to large; tree bears well, but can only be classed as a second-grade variety in this district as an oil producer; the fruit makes excellent pickles, either green or ripe; ripened middle of April. [Plate IV.]

12. *Columbaro.*—Fruit medium size; promises to be a good bearer in this district; have not tested its value as an oil producer. [Plate IV.]

13. *Dr. Fiaschi.*—A very small olive, of no value for pickling; has not been tested for oil production as yet. [Plate IV.]

14. *Oblonga.*—Fruit medium size; tree bearing good crops; makes a good pickle, either green or ripe, and is said to make rich oil; has not been tested as yet as to its oil-producing qualities. [Plate IV.]

15. *Correggiola.*—Fruit a little below medium size; ripened 16th May; the best variety at our Wagga orchard for producing a large quantity of oil—producing even more than the Bouquettier from the same quantity of fruit; can be highly recommended as one of the very best varieties to grow for oil in this and similar districts. [Plate V.]

16. *Pendulina.*—Fruit medium size; tree a good bearer; fruit makes excellent green pickle; its oil test is one of the lowest at the orchard, and, therefore, I could not recommend it; ripened 26th April. [Plate VI.]

17. *Bella di Spagna (Belle d'Espagne).*—Fruit medium size, but has proved a poor variety as an oil producer at this orchard; tree a good bearer, but I would not recommend planting it. [Plate VI.]

18. *Regati.*—Fruit below medium size; has not yet been tested for its oil-producing quality. [Plate VI.; also Plate II.]

19. *Verdale.*—Tree of dwarf habit; generally said to be an eccentric bearer, but is doing fairly well at this orchard so far; fruit rather small, but rich in oil; ripens early in May. [Plate VII.]

20. *Atro Violacea.*—Fruit below medium size; has proved to be a very poor oil-producer, and only a moderate bearer; could not recommend it to a place in the orchard; ripened 21st April. [Pl. VII.]

21. *Gros Redondau.*—Fruit medium size; tree rather a shy bearer; has not been tested yet as to oil-producing quality. [Plate VII.]

22. *Boutillan.*—Fruit medium size; tree a good cropper; have not yet tested its oil-producing quality; ripens unevenly. [Plate VII.]

Mr. Hogg, the orchardist at the Wagga orchard, has tested the following varieties, which I will name in their order of merit. There has been only one test made of each variety, so far; so that I am not in a position to say that the quantities might not improve under further tests. A reference to the collection of small bottles will show that some of them are full, while others are only partially filled.

For the purpose of ascertaining which were the best varieties for oil-production in this district, 6 lb. of each variety were taken. These were crushed and all treated exactly alike; and the results will, therefore, serve to give a general idea of the oil-producing quality of the varieties in question. I may say that only a few varieties have been tested as yet, and it is my intention to have these experiments continued next season, for the purpose of further ascertaining which of the other varieties now growing there are the very best and most profitable to grow either for oil or pickling.

Names of Varieties Tested.

No. 1. Bouquettier.
Nos. 2 and 9. Correggiola.
No. 3. Verdale.
No. 4. Attica.
No. 5. Ragialo.
No. 6. Polymorpha.
No. 7. Tarascon.
No. 8. Manzanillo.
No. 9. Correggiola.
No. 10. Oblonga.
No. 11. Atro Violacea.
No. 12. Arecluzzo.
No. 13. Bella di Spagna.
No. 14. Nevadillo Blanco.
No. 15. Pendulina.
No. 16. Macrocarpa.
No. 17. Regalis.

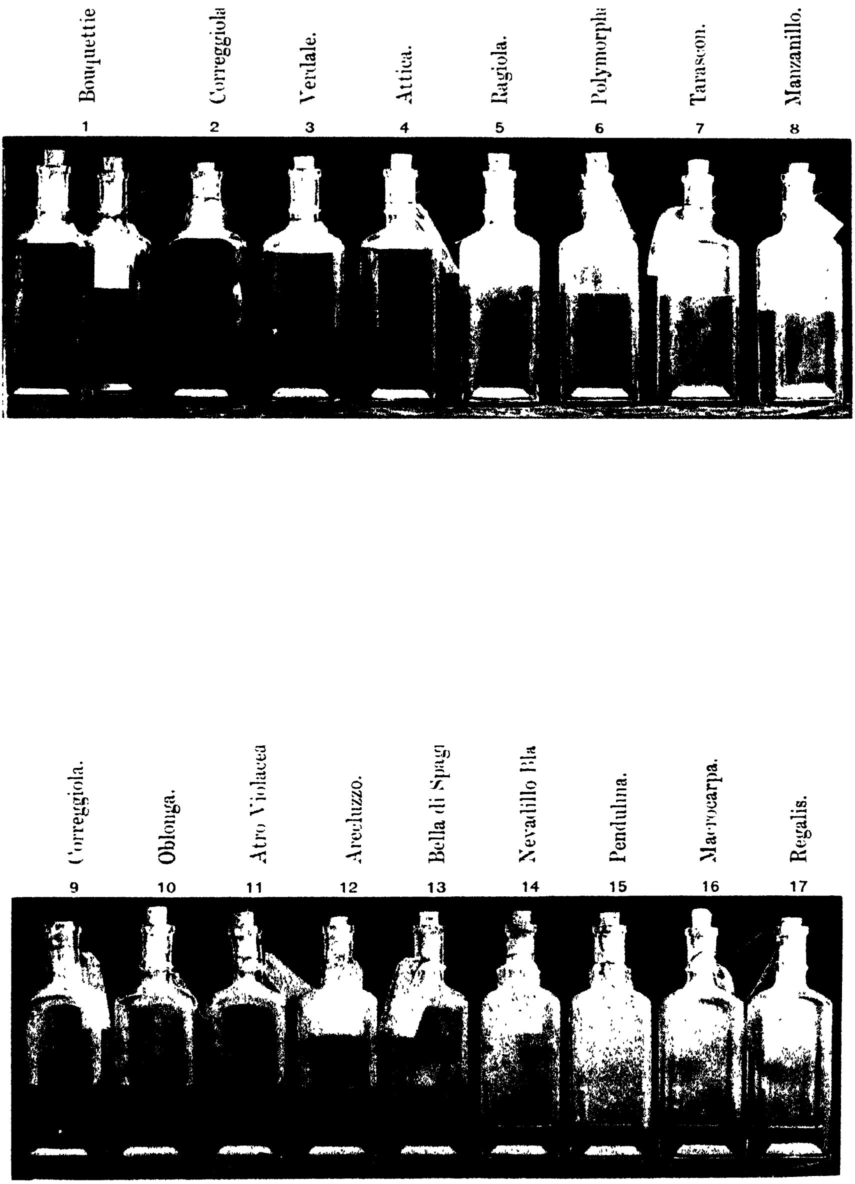
It will be seen that it took two bottles to hold the oil made from the Bouquettier and Correggiola olives, there being one bottle and a part of another of each of these varieties. By an oversight the two bottles holding the oil from the Correggiola variety were not placed alongside each other for photographing, but there is but slight difference in the quantity of oil yielded by this and the Bouquettier variety. The quantity yielded by these two is so greatly in excess of that yielded by the other varieties tested, that they are the only two so far tested which I would recommend planting where oil-producing is the object in view.

The Verdale and Attica come next in point of merit as oil-producers, but these do not produce as much by one-third as the first-named, and the remaining varieties are practically valueless for this and similar districts. Of course, as I said before, this is a first test, and future tests might give slightly improved results.

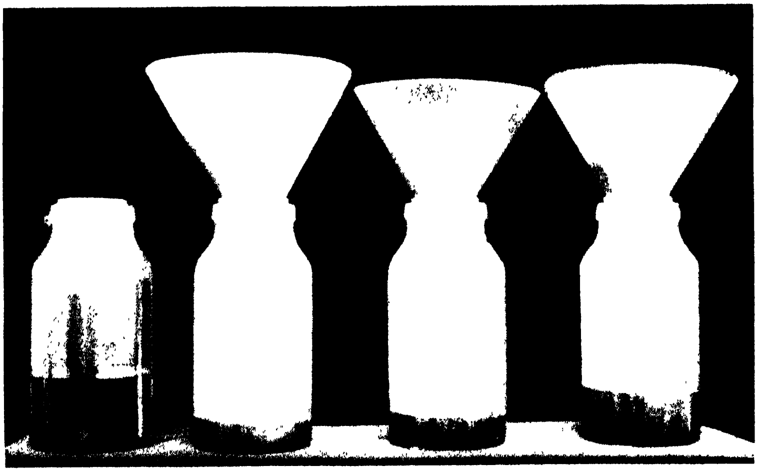
The varieties of olives tested ripened in the following order :—Nos. 10, 6, 11, 1, 5, 13, 15, 12, and 8 ripened from the 19th to the 30th of April; Nos. 16, 14, 7, 2, 9, 3, 17, and 4 from the 1st to the 22nd of May.

To sum up, then, so far as our experimental work with the olive has gone, the Bouquettier and the Correggiola have proved themselves far superior to all the others; and while we have these two with us it would be unwise to plant extensively of even the Verdale and Attica, which came out next best, the two latter having produced only about two-thirds the quantity of the two former. If the next series of experiments will add one or two more varieties to the list which will be equally as good as the best of these, it will be of advantage to the growers, as it is best to have more than one variety growing in the same orchard, as there is the chance of some of them proving infertile when grown alone, which, if grown with other varieties which bloom at about the same time, might produce regular crops.

Another advantage in planting more than one variety is that of having fruit which ripens at different times, so as not to have the whole of the crop coming in at once; on the other hand, it is best to plant varieties which ripen and can be harvested before the frosts



OLIVE CULTURE.



Clarifying and Filtering the different Experimental Oils

Different Grades of Oils—1st, 2nd, and 3rd.

visit the districts in which they are grown. We have several kinds now growing at Wagga Wagga, which, while they produce heavy crops and may be rich in oil, could not be recommended owing to the fact that they ripen too late. What we require are varieties which can be harvested by the middle of May at the latest, as, after that time the fruit is liable to be frozen, and it is too cold for the oil to separate from the pulp without the room being heated. It is also found that the oil separation is more evenly obtained and rapid with some varieties than with others.

Gathering the Olives for Oil.

The olives are either stripped by hand into baskets or shaken into sheets previously placed under the tree for the purpose of catching them and preventing their falling on to the ground, which would bruise them. By falling on the cultivated soil the skin of some would be broken, and the dust and dirt would adhere to these. On no account should the branches be beaten with poles, as the limbs and branches are liable to become damaged.

After picking, the berries are run through a fanning mill, which blows out all leaves, small twigs, and other rubbish. They are now ready for the drying room or the crusher.

In California most of the olives are dried in drying houses built for the purpose. They are spread in thin layers and the heat kept at from 110° to 130° F. It takes about two days to dry them, after which they should be run through the crusher as soon as possible.

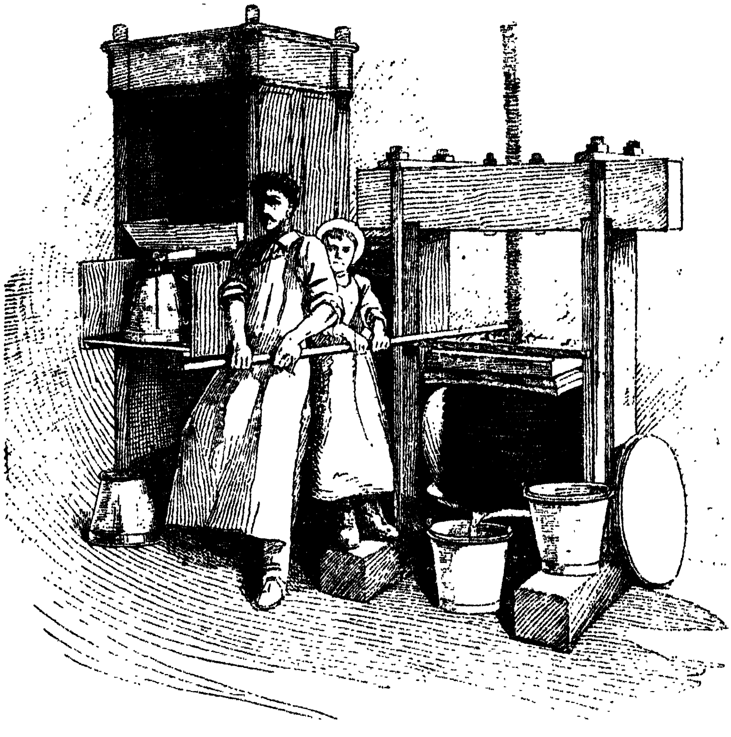
Neither the fresh nor the dried olives should be allowed to stand for any length of time after they are picked, or else they will ferment and make a low grade oil. When once work is commenced every part should be run systematically, so that just enough fruit is picked daily to keep the dryer, crusher, and presses going. Here, in Australia, very few of the olives are dried, but picked and taken to the place where they are to be crushed, run through the winnower, then crushed and pressed with as little delay as possible.

Extraction of the Oil.

Although the best oil is made by separating the flesh from the pit without crushing the latter, this method has not come into general use yet, as it is difficult to get a machine at a reasonable cost which will accomplish this; and, therefore the method usually adopted is to crush the olives with a heavy granite roller, similar to that illustrated in the cut, and which revolves in either a stone or concrete and cement basin, and crushes the olives to a pulp.

It is claimed that a stone 5 feet in diameter and 2 feet thick will crush in eight hours a sufficient quantity of berries to make 100 gallons of oil, and by working it night and day the crop from 125 acres can be treated. Some mills in use for preparing olive pulp are made of cast iron, the crushing being done by a series of rollers.

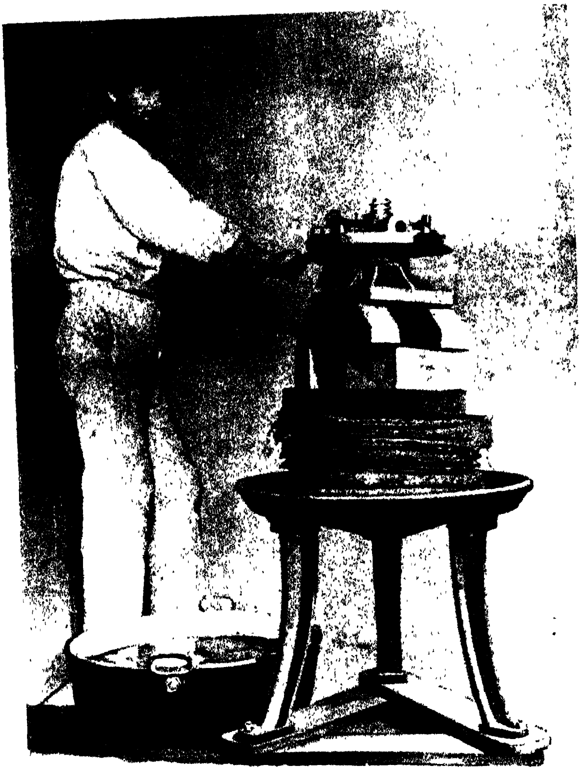
As soon as the olives are thoroughly crushed, the pulp is removed and placed in sacks for pressure. These sacks are made of different material. The French mats are made of a fine fibrous grass, while those used in Spain and Italy are of a coarser material. The sacks are made in a circular shape, with the opening in the centre for the purpose of filling and emptying them. Coarse linen is also used, in which to place the pulp before crushing. When these sacks or mats are filled with pulp they are placed in the press, one above another with wooden slats or perforated circular iron plates between. Eight or more of these mats can be placed in the press at one time, according to its size.



Hydraulic and Screw Presses at Work.

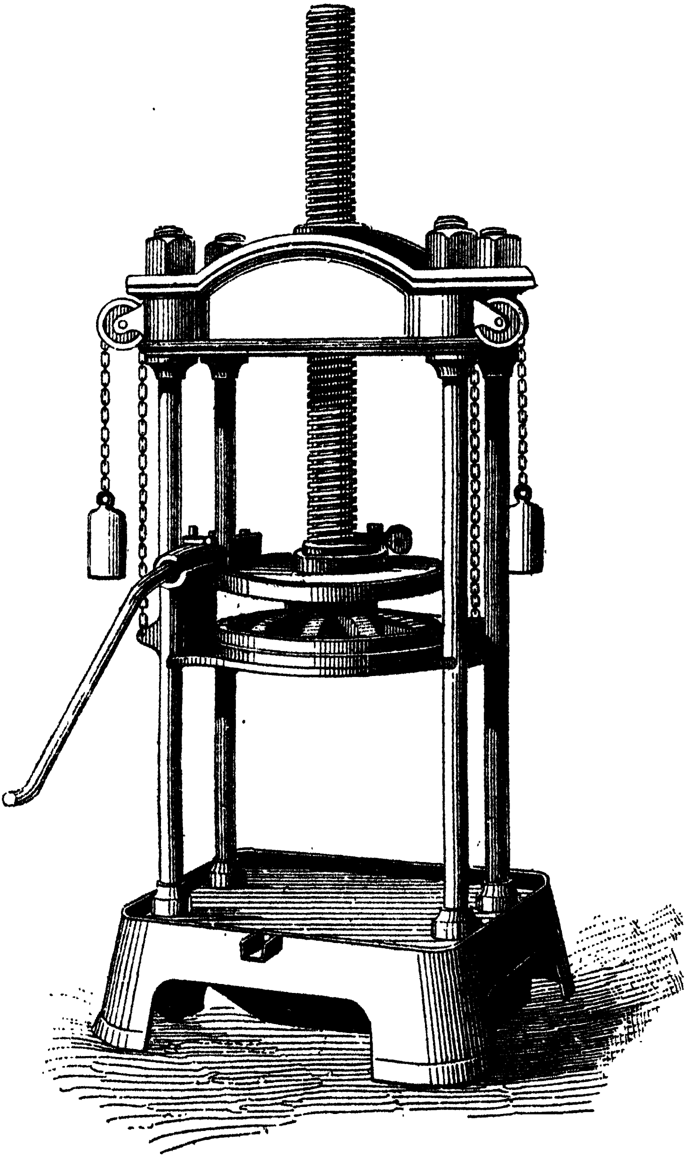
Hydraulic, screw, and lever presses are all in general use. In many places, where large quantities of olives are processed, the old-fashioned lever press is liked, because the pressure is continuous; whereas the hydraulic and screw presses require constant attention, else the pressure is not regular. Either of these, with proper attention, will do good work; but, if there is any timber about, the lever press can always be erected at a very small cost.

Pressure must be applied gradually and with caution, and from the first pressing results the virgin or best quality of oil. The pressure is then increased to the full, and from this results the second quality of



Small Press in use at the Wagga Orchard for experimental purposes.

oil. After obtaining all the oil possible, the mats are emptied, and the pulp broken up in hot water and again pressed, and from this the third quality of oil is obtained. The very best varieties of olives will yield about 2 gallons of oil for every 100 lb. of fruit.



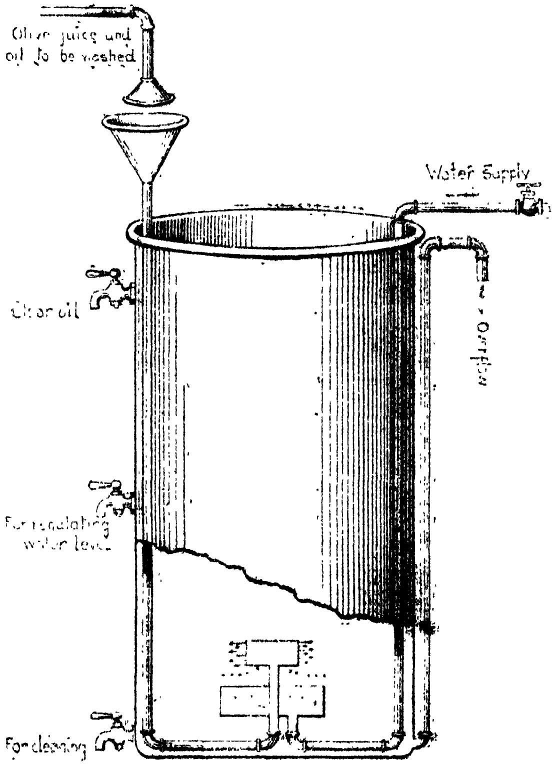
Heavy Screw Olive Press.

Separating the Oil.

If the liquid as it runs from the press is allowed to stand for a day, large quantities of oil can easily be skimmed from the top; in fact, for those having only small quantities of olives, a separator, such as that shown in the accompanying cut, would be rather too expensive.

In his pamphlet, Bulletin No. 123 of the University of California Agricultural Experiment Station, Mr. F. T. Bioletti gives the following description of an oil separator, similar ones to which I have seen used by some of our larger olive growers, viz. :—

Separation of the Oil.—The liquid that runs from the press contains, besides the oil, the watery juices of the fruit and a considerable amount of pulpy, solid matter. The separation of the oil is usually effected by allowing the press-liquid to settle in tinned vessels until the oil, rising to the top, can be skimmed off. The use of the apparatus shown above is a great improvement over this method. It makes the separation of the oil almost instantaneous, and improves the quality by doing away with the prolonged contact of the oil with the air and the impurities of the liquid. The juices



Oil Separator.

from the press flow into a tube, which opens into a small "drum" near the bottom of the tank, which is kept constantly full of water. The drum is perforated at the sides, in order to allow the press-liquid to escape horizontally. Immediately below this drum is another larger one, perforated on top, through which water is forced in vertical jets. The water and press-liquid are thus thoroughly mixed in constant agitation. This results in the rapid deposition of the heavy impurities, and the equally rapid rise of the small, light oil drops. The oil very quickly forms a layer on top, and can be drawn off by means of a faucet appropriately placed. The apparatus is continuous in its operation, and the oil is obtained free from all the grosser impurities. It is still, however, very cloudy, owing to the presence of small, light particles of vegetable matter.

The oil from certain varieties of olives will rise to the top much more readily than that from others. As it rises to the top it is skimmed off and stored in settling tanks, where it may remain from two to three months, when a natural precipitation will have thrown down nearly all fungus matter, and the oil is ready to pass through the filter, which may be made by lining a conical bag of heavy filtering felt with several thicknesses of white cotton batting; or, simpler still, by using a glass or tin funnel with cotton batting in the bottom, through which the oil will pass. The final filtering is accomplished by placing filtering paper in large funnels, and allowing the oil to pass through these, when it should be ready for the market.

From the report of the State Board of Horticulture on the California olive industry, I quote the following on olive oil filtering or clarifying, viz.:—

> This is a simple process. The most common method is to have a series of five or six boxes, one above the other, each with cotton batting in the bottom. The oil passing the sixth will be beautifully clear and ready for market. I use cylindrical tin vessels, holding about 3 gallons each, one fitting in the other, in tiers of three, with fine wire sieves in the bottom of each. On these sieves I place two or three layers of cotton batting. The oil is passed from one tier to the other until clear. The clarifying can be done by sunlight; also, the oil can be bleached and made much lighter in colour, but not without injuring it. When it is adulterated, artificial heat is necessary in the process. When once heated it loses a part of the nutty flavour, and is liable to become rancid when exposed to the air. It should be kept in an ordinarily cool place, not exposed to sunlight or heat; neither should it be handled any more than is absolutely necessary in the filtering and bottling, and should not be shaken after bottling. The mucilage contained in the oil will not separate for a long time after the oil is ready for use, and, as it does not injure it, is not, therefore, objectionable. It will sometimes form in the bottles like globules of water, or in films, settling to the bottom as sediment, and when shaken will give the oil a muddy appearance, which, with the common prejudice against all table oils that are not perfectly clear, renders it unsaleable, as consumers consult more the eye than the taste. The oil is better when new and fresh, and what is gained in appearance by its remaining a longer time in the tank is more than lost in its freshness and delicacy of flavour.

Cleanliness is a most essential feature in making olive oil, as this oil readily absorbs all taints and odours. No offensive smell, and no tobacco smoke or smoke of any kind, should be allowed about the oil house, and all articles in use, as well as the building itself, should be kept scrupulously clean by daily washing with boiling water.

Mr. Chas. Chaffey, of Renmark in South Australia, who makes a large quantity of olive oil, has kindly furnished me with the following :—

Olive trees were first introduced into South Australia by Sir Samuel Davenport and the Sheriff of Adelaide, W. R. Boothby, Esq., C.M.G. This was about thirty years ago, and the planting of the olive near Adelaide by these gentlemen, and subsequent manufacture of oil by them, proved conclusively that the soil and climate of South Australia were well suited to the successful culture of this fruit. When the colony of Renmark, on the River Murray, was started, in 1888, I was informed by people who had cultivated the olive near Adelaide that the trees would not grow well, nor bear fruit, at any distance from the coast, on account of the extreme heat and dryness of the atmosphere. This was, however, soon proved to be a mistaken idea. Trees were planted at Renmark, and at five years from the time of planting they had attained the size of ten year old trees growing in the vicinity of Adelaide. In regard to fruit, also, it has been found that our Renmark orchards bear a much heavier crop per tree than do those of the same age near the coast,—so much so that the growers of Adelaide and vicinity will not credit the returns we get from our orchards here. It should be borne in mind, however, that our trees are grown under irrigation, whereas those about Adelaide depend largely, if not altogether, on the rainfall, and it is doubtless owing to an abundant supply of water as well as the advantages of climate and the liberal use of fertilisers, that the good results obtained in Renmark are to be attributed.

Any kind of soil has been thought to be good enough for the olive, and there is no doubt the tree will live in almost any soil ; yet there is no fruit-tree that responds more readily to good soil, good care and good cultivation. My own trees are planted on the poorest soil on the place, but they have received good care and have been well fertilised, and my experience is that they pay a very fair return on the outlay. This return I expect to be still more satisfactory as, through Federation, our market becomes larger and steadier.

I have not as yet gone in for pickling olives, as I find that as yet the demand for pure olive oil is in excess of the supply, and it is less trouble to make good oil than good pickled olives. The manufacture of this article is found to be a very profitable industry in California, however, the demand for pickled olives throughout the States being enormous ; but in Australia the public palate is not educated to an appreciation of this dainty, and consequently there does not seem to be much opening in this direction as yet.

In planting an olive orchard, it is, I think, preferable to use seedling stocks, budded, rather than truncheons, the former making stronger and better trees, besides being less addicted to growing suckers. Truncheons make a good growth after the first year, but, as they have no tap-root, the roots are near the surface, and the tree is top-heavy, and liable to blow over in a wind storm. This is particularly the case when the ground is soft after a heavy rain or an irrigation. The best varieties to plant for oil are the Bouquettier, the Salome, and the Verdale. The last mentioned has not as large a proportion of oil in the fruit as the former, from which the oil runs after crushing without pressure. The Lucca variety is also highly spoken of around Adelaide, but I cannot speak of these from actual experience, as my trees of this kind are not yet bearing, though they have made good growth and promise to do well. As to the distance apart to plant trees, I advise a less distance than

Olive-crusher in shed of Mr. C. Chaffey, at Renmark, S.A., at work, with a capacity for crushing two hundredweight of fruit every half-hour. Rollers and basin are cut from Aberdeen granite.

OLIVE CULTURE.

30 feet—say from 20 to 25 feet. If the trees are planted far apart they must be allowed to grow to a considerable height, in order that they may carry a large crop; but if the tops are high the fruit cannot be properly picked by children, and it will not be found to pay to employ men for this purpose. Therefore, cultivate well, fertilise heavily, and keep the trees low, in order that the fruit may be easily picked. The trees do not require heavy pruning; they should be headed low and the centre kept open to allow a free circulation of air, which tends to keep them free from black smut and the black scale, which is their greatest enemy. As the olive bears on old wood, this light pruning is necessary, for any large amount of wood removed will tend to lessen the crop.

The fruit should be picked when it becomes a deep wine colour. After this stage is reached and passed, the oil becomes greasy, and the result is an increased quantity of oil, but of an inferior quality. On my place we employ children to pick the crop. Both boys and girls can do the work, and they are paid by the box, which contains one-third of a hundredweight. The method of picking is to spread sheets (made from wheat bags) on the ground beneath the tree, and to strip the fruit from the branches by hand, allowing the olives to drop on to the sheets, whence they are poured into the box. Ladders are required to reach the upper branches. The boxes of fruit are carted to the mill as soon as picked, when the business of making the oil is begun. In California, the olives are partially dried before being crushed; but we have found that the fruit is more easily handled, and that the oil runs more freely when the berries are comparatively fresh. We keep them sometimes for several days before crushing, but no longer than we are obliged to from pressure of work.

My mill consists of two large round stones, revolving in a round stone trough, both stones and base being cut out of Aberdeen granite. It is worked by horse-power, and will grind about 2 cwt. at a time, being refilled every thirty minutes, or less. After being ground, the fruit is put into large flat galvanised pans, from which it is shovelled into esparto grass mats, 2 feet in diameter, which hold about 40 lb. each. These mats (called *cabas*) are made expressly for this purpose, and are imported from the South of France. When filled, they are piled one on top of another in the press, with a steel plate, 2 feet in diameter, between each one and the one above it. These plates assist materially in forcing out the juice and oil when the pressure is applied. The liquid runs into a receptacle, or pan, at the base of the press, on which the mats rest, and thence it pours into a bucket placed beside the press to receive it, which is emptied by an attendant as soon as full.

My presses consist of a beam press and a screw press for the first pressure, and a hydraulic wool dumping press for the second and final pressure. The first has a beam of red-gum, 12 in. x 14 in., 55 feet long, which, when weighted with scrap at the extreme end, gives a pressure of about 15 tons. The screw press (the screw of which came out of an old wool press) gives about the same pressure, while the hydraulic press has a pressure of from 75 to 80 tons. After the full pressure has been applied by the beam and screw presses, the mats are taken out and each one doubled up, to loosen the pulp, and dipped in cold water, after which they are piled up, as before, in the hydraulic press. The oil obtained from the first pressure, and the second pressure with *cold* water, is virgin oil, and brings the highest price. When the oil has ceased to run from the hydraulic press, the mats are taken out and emptied and the residue is put aside, to be, after all the olives have been subjected to the first process, mixed with hot water and once more put through both mill and press, only the hydraulic being used for this final pressure. The oil thus obtained is of inferior quality and is sold as *salad oil*, bringing a lower price than the virgin oil.

In the meantime, the liquid from the first pressure has, as it was removed from the press, been put into a tank, which connects with the separator. The latter is another tank, holding about 50 gallons of water, which has in it a simple arrangement of pipes, by means of which the olive-juice is first conducted to the bottom of the tank and thence flows up through a tin rose, meeting, as it comes out, water flowing from another rose connected with a pipe immediately below it. The water, which must be under pressure, mingling with the juice, sets free the particles of oil, which rise to the top. When a sufficient quantity of oil has accumulated on top, it is drawn off by means of a tap, situated about a foot from the top of the tank. The heavier matter sinks to the bottom and is drawn off through a syphon, which conducts it into a tank with a goose-neck, whence it again flows into another and smaller tank. In these tanks the water is kept at a level of 3 inches from the top. Any oil that may have escaped from the separator accumulates on top of the water, and can be removed, the second tank affording a still further opportunity of saving every particle of oil.

The second-pressure oil—that is, the oil secured after dipping in cold water—is treated differently. It is put through a series of tanks with overflow pipes arranged to keep the water at a level just below the edge of the tank. As the juice is poured in the oil accumulates on top of the tanks, and is drawn off by means of taps placed near the top. This separator is also used later on for the third pressure oil.

The oil of different grades is put into separate tanks, which hold from 100 to 200 gallons each, and is allowed to stand and settle until the weather becomes a little warm, when it is drawn off and strained through cotton wool. Further filtering is unnecessary if the oil has been allowed sufficient time to settle and clear itself. Of course, if the room where the oil is stored can be heated artificially, the oil will be ready for market much earlier in the season than if left till the beginning of the warm weather.

When clear and ready for market, I put my oil in 10-gallon milk-tins and ship it to Adelaide. These receptacles I have found, after a number of experiments, to be the most convenient available. They are strong, easily handled, and easily cleansed. In Adelaide the oil is bottled, or sold in bulk, if intended for use outside the colony. At one time we did our own bottling also, but I soon found that this could be done more cheaply and satisfactorily in the city.

Pickling.

For the past two years we have been pickling a limited quantity of olives—some by the water and others by the lye process—the former being done as follows:—Pick the fruit carefully, so that none will be bruised, putting it into buckets of water as it is picked from the tree. The best time to pick is just before the olive has turned a purple colour, as, to my idea, a ripe pickled olive is far superior to a green one.

As soon as the fruit is gathered, place in a wooden vat, or large earthenware vessel, and cover with fresh water, which latter must be changed every day until the bitterness of the olive is removed. The process requires from thirty to sixty days, according to the condition of the fruit.

In California large quantities of both green and partially-ripe olives are pickled every year by the lye process. There are several different methods of treating them, of which the following is said to be one of the best, and has been adopted by us at the Government orchard, and is recommended by the California State Board of Horticulture, from whose report I cannot do better than quote as follows :—

> Olives are pickled in four stages of ripeness :—(*a*) Green—before ripe ; (*b*) reddish cast—when the olives have become a dark red colour, before changing to black ; (*c*) ripe—when the olives have become black ; (*d*) dead ripe.
>
> *Green Olives.*—The fruit is picked with care, into lined baskets, just as it has reached full size, and before indications of ripening begin, which is shown by tints of red forming on the fruit. After years of experimenting in the production of pickled olives, I have obtained best results by pursuing the following course :—The olives are placed in shallow vats, which have previously been half filled with water, to prevent any fruit from being damaged when being emptied into them. The vats are filled with fruit to about 75 per cent. of their capacity. A lye solution is then made in another vat, either above the one containing fruit or near it. *Fifteen* pounds of pure potash, or Greenbank powdered caustic soda, are dissolved in a wooden tub containing from 5 to 10 gallons of water. The potash or caustic soda is first placed in the tub, and the water added. If the soda be used, the water must be cold ; if the potash be used, the water must be hot. The soda generates great heat, and readily dissolves in the course of a few minutes. In another tub is dissolved 6 lbs. of lime, which is allowed to settle. The clear liquid is then drawn off and added to the lye. Water is then added to make, in all, 100 gallons of solution. The plug in the vat containing the fruit is then drawn out, and the water in which the olives have been is allowed to run out. The fruit is then covered with the lye solution. The room must be darkened, and no current of air allowed to pass through it during the changing of the lye, for exposure to light and air will change the colour of the fruit from green to a coffee brown. The fruit is kept in this condition until the bitter principle is neutralised by the lye, which varies, according to variety, from twelve to sixty hours. The lye is then allowed to run out, and immediately water is run in and the vat filled to the top. The water is changed every day for four or six days, until every trace of lye is removed, which can be told by testing. The fruit is cut with a knife, and if there is no lye around the pit, it is then time to add the brine. At first it is best to put a light brine—6 oz. of salt to the gallon of water on the fruit, because it prevents the fruit from discolouring and shrivelling. After the fruit has been thoroughly pickled and the colour firmly set, so that it will not discolour on being exposed, it is put into a stronger brine made of 12 or 14 ounces of salt to the gallon of water, and in three to four weeks it is ready for market.
>
> The success in pickling green olives, so that they will retain that delicate green colour, depends on the care and precision taken in running off the lye, the immediate covering of the fruit with water, the darkened room, the prevention of draughts passing through the operating room while the water is being changed, the purity of the chemicals used, and the care in making the brine.
>
> *Reddish Cast.*—Olives of a reddish cast, or before fully ripe, are selected and pickled separately. If cured by the lye process, they keep longer than fully-ripe fruit pickled by the same process. If cured by the water process, they become greatly discoloured, owing to uneven ripeness. In pickling olives in

this state of ripeness, it is best to add to the lye solution the clear liquid of at least 10 lb. of lime, to set the colour.

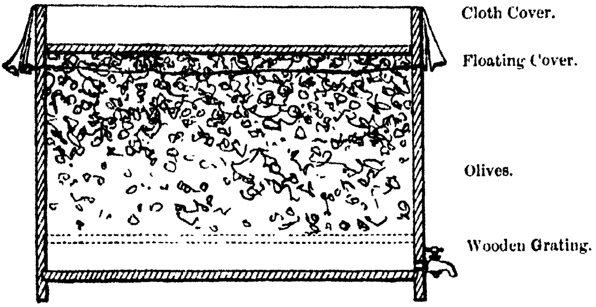
Ripe.—"This state of ripeness is indicated by the jet-black colour olives assume. The fruit must be perfectly sound. They must be picked from the tree by hand, and the trees gone over several times, unless they be of a variety of even ripening. After having been assorted, they are placed in vats half full of water, to prevent bruising, and when three quarters full the water is run off and the fruit covered with the lye solution. They are kept in the lye until the bitter principle becomes neutralised, which varies according to the variety, locality, soil and climatic influences, &c. During the operation the fruit should be tested from time to time by taking out a few, washing them in clear water, and then cutting the fruit with a knife. If the lye has only penetrated a short way they should be left longer in the lye or until all trace of bitterness is removed. The lye is then run off and water run in immediately, which is changed every day or so, until no trace of lye is found in the fruit. A light brine made of 6 oz. of salt to the gallon of water is then put over the fruit, in which the fruit is kept a week or more. This light brine is then run off and a stronger brine, consisting of 14 oz. of salt to the gallon of water is put on the fruit. It is very essential that the first brine should be weak, as a stronger brine tends to shrivel the fruit, which destroys its commercial value. After the olives have been in the last brine two or three weeks, they are ready for market, and must be then put into a specially prepared brine. Olives grown in varied situations differ in bitterness, and it often happens that a second (or a third) application of lye becomes necessary to neutralise the bitter principle in the fruit."

Mr. F. T. Bioletti, in Bulletin No. 123, issued by the University of California Agricultural Experiment Station, says :—

The successful production of pickled olives is a matter of experience, and depends almost altogether on the individual judgment and skill of the producer. No method can be given which is suitable to all cases, and the best method must be modified according to the nature of the olives to be treated. The following scheme, therefore, is to be considered as a mere outline, to be carefully adapted and modified by the operator, at each stage of the process.

Lye-Process :—1. Place the olives in a solution composed of 2 oz. of potash lye to 1 gallon of water, for four hours. Repeat this once or twice, if necessary, to sufficiently remove the tartness. 2. Rinse the olives thoroughly and replace the lye solution with fresh water. Change the water twice a day until the potash has been removed from the olive, as judged by the taste. 3. Replace the water with brine, composed of 4 oz. of salt to a gallon of water, and allowed to stand two days. 4. Put in brine of 6 oz. of salt to a gallon, for seven days. 5. Put in brine of 10 oz. per gallon, for two weeks. 6. Put finally into a brine, containing 14 oz. of salt to the gallon of water.

In order to make this process a success, the following considerations should be kept in view :—1. Great care should be taken not to allow the olives to come in contact with anything that will injure their flavour. The vats or other receptacles used for pickling should be perfectly clean, odourless, and tasteless. Earthenware is the best material, but it is usually cheaper and more convenient to use wooden receptacles thoroughly treated with boiling water and soda until they are sterilised, and all taste of the wood removed. Any wood (such as pine) with strong taste should not be used. The vats should be provided with a removable wooden grating, fastened 1 or 2 inches from the bottom, and a close-fitting floating wooden cover to prevent access of air, which spots the fruit. On top of the vats should be placed a cover of thick cloth or of wood to exclude light and dust. Each vat should be provided at the bottom with a wooden spigot for drawing off the solutions.



Pickling Vat.

The thickness of the layer of olives should not be more than 2 feet, or less with soft varieties.

2. Only the very best of potash lye should be used. Some of the brands of lye are so impure that it is impossible, without a chemical analysis, to tell within 40 per cent. how strong the lye solution actually is when made up. "Greenbank Lye" has been found the most reliable, and may be considered as 100 per cent. pure when making up the solution. The length of time which the olives should be left in the lye, and the number of times the lye should be renewed, can only be determined by experiment for each variety and each locality. The object is to extract the tartness of the olive, and at the same time to soften the skin sufficiently to allow the tart or bitter substances to be soaked out in the subsequent treatment with pure water. The tougher and thicker the skin of the olive, and the more intense the tartness, the longer must the lye treatment be continued. The lye is sometimes made twice as strong as recommended above, and the treatment correspondingly shorter, but the results are not so good. Just enough lye solution should be used to exactly cover the olives, and occasionally during the soaking, some of the solution should be drawn off below and poured on top to insure an equal treatment of all the fruit.

3. Only the very purest water should be used, both for the lye solution and for the subsequent soaking. Canal and river water, or any water that contains a great deal of organic matter, should never be used unless it is practicable to boil it first. Distilled water, such as can sometimes be obtained by condensing the waste steam from a boiler, is the best, both on account of its purity and its greater extractive power, provided of course it be free from oily flavours. The length of time during which the soaking in pure water should be continued, varies very much in accordance with the character of the fruit. If the olives are firm and show no signs of becoming soft, it should continue until the tartness is sufficiently extracted. This will vary, usually between ten and twenty days. The moment that the olives begin to show signs of softening, however, they should be placed in weak brine, even though the tartness has not all disappeared.

What remains can then be extracted by the brine, which should be changed two or three times, as may be necessary. It is not necessary to change the brine quite so often as in pure water—once in two days being generally sufficient.

If the olives are soft at first, before treatment with lye, or if they are of a kind that soften rapidly in the lye, it is necessary to use brine from the beginning, either immediately after treatment with lye or, in extreme cases, with the lye. This method, suggested by Professor Hilgard, has been used with marked success. The lye solution in this case should be made by adding 2 oz. of lye and 4 oz. of salt to each gallon of water. As the lye acts much more slowly when used in combination with salt, it may be allowed to stay on the olives for a longer time without injury—eight to twelve hours or even more. In this way the lye solution tends to soften and swell the olives; the brine counteracts this and tends to harden and shrink them. The shrinkage, which occurs when brine is used from the beginning on naturally soft olives, is not a disadvantage if not carried too far, as such olives are generally too watery to be palatable or to keep well. They can, moreover, if shrunk too much, be made plump again by a few treatments with pure water before being put finally into brine.

The first salting must be done very gradually and carefully in order to prevent shrinkage and wrinkling of the fruit. For this reason, gradually increasing strengths of brine must be used, as described, and the olives left long enough in each to be thoroughly penetrated.

In all these operations no sign of scum or slime should be allowed to accumulate on the olives, the vats or the covers. This is of especial importance during the treatment with plain water. On the first signs of sliminess around the sides of the vats, where it appears first, they should be emptied and thoroughly brushed and scalded before replacing the olives.

Pure Water Process.—The best pickled olives are made without the use of lye, but this process is only practicable with olives whose tartness is easily extracted, and where the water is extremely pure and plentiful; and even then it is very slow and tedious. It differs from the last process only in omitting the preliminary lye treatment. The olives are placed from the beginning in pure water, which is changed twice a day until the bitterness is sufficiently extracted. This requires from forty to sixty days or more. The extraction is sometimes hastened by making two or three shallow, longitudinal slits in each olive, but this modification, besides requiring a large amount of expensive handling, renders the fruit peculiarly susceptible to bacterial decay and softening. Altogether, the pure-water process cannot be recommended for California, as it is too expensive and uncertain.

Green Pickles.—Green pickled olives are made by essentially the same processes as are used for ripe pickles. The extraction of the tartness requires the same care and the same close adaptation to peculiarities of different varieties as already described. The olives are pickled soon after they have attained full size, and before they have shown any signs of colouring or softening. They contain at this time comparatively little oil, and are in every way much inferior to the ripe pickles in nutritive value. They are not a food, but a relish. They are rather more easily made than the ripe pickles as there is less danger of spoiling. There is, however, very little market for any but the largest sizes.

Breeding Thoroughbred Poultry.*

J J McCUE.

Selection.

THERE are two kinds of selection, natural and artificial. Natural selection means an operation of the laws of Nature, the result of which is supposed to be "the survival of the fittest." This survival of the fittest means those birds or animals that conquer in the struggle for existence, that are the best constitutioned, and that are the best foragers and fighters for food to enable them crush out the weak and reproduce themselves. All birds and animals in their natural or wild state are exposed to danger of death through the whole of their existence, viz., by their natural enemies, by lack of food, and at times by disease. These varied dangers cause many deaths, so those that survive the dangers are generally speaking the best fitted to reproduce their kind. Nature is very careful and regular in her laws; she balances and keeps birds and animals in a proper environment.

Artificial selection differs from natural selection, in that man assists, adds, and improves on natural selection; it also prevents many of the dangers that birds are exposed to in their natural state. Selection by artificial methods means isolation. We pen certain birds and isolate them from others of their kind, so that our work- for colours, comb, egg-production, &c.—will not be interfered with. By artificial selection, climatic influences, and domestication we have altered the original fowl into many varieties of shape, colour, &c., and instead of the hen laying one or two nestfuls of eggs in a season, we have varieties that lay as many as fifteen to twenty nestfuls. We also have many points and characters not to be found in the wild fowl, viz., large size, feathered legs, rose combs, crest, and other features.

In the long years of artificial selection all these characters and qualities have been gradually developed, and man is still adding or improving them. A good layer of the present day would have been an impossibility but for the selection, food, care, &c., bestowed upon its ancestors. In artificial breeding the breeder selects his birds for some definite object. If he be a thoroughbred breeder of standard exhibition birds, he devotes his labours and brains to producing the colour, shape, feathering, and points that go to make up the perfect specimen of the breed he keeps. If, on the other hand, he be a breeder or fancier of thoroughbreds for general, useful purposes, he will be careful, or should be as careful as the exhibition fancier, in producing his general utility qualities.

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* In the preparation of this paper I have made reference to and quoted from my former articles on the subject.—J. J. McC.

Proper selection, mating, and breeding of purebred fowls cannot be learnt in a day; it is a study that leads us into many difficult places, especially is this the case when the material we are using is not well known to us. In all selections and matings of birds we should have a knowledge of the qualities, faults, and varieties of the males and females we intend to use. If we know these, or it is possible to secure this knowledge, then our task is not so difficult as it would be when we are working in the dark. On the other hand, if we work with birds totally unknown to us—that is, do not know their pedigree, or their parents' pedigree, or the parents' qualities, faults, &c.—we have only the birds themselves to start upon. If this is the case, we should first compare our birds singly with the standards—let them be either exhibition or utility standards—laid down for the breed; and this is where experience and sound practical judgment come in. We should commence with the male first, and note the points that are good, and those that are deficient. Then we must criticise the hen closely, noting her good and bad points. Then comes the comparison of the points given to the male and to the female; if the male has the same, or nearly the same faulty point or points that the female has, then it would not be good judgment to mate them. But if the male has deficiencies, but not of the same nature as those of the female, and is good in points where the female fails, the mating will not be bad for that season. The breeder must have patience if he wishes to produce first-class specimens of any animals; it cannot be done in a day or a year, nor can we "rub out" a blemish in colour, or other fault as if it were a slate-pencil drawing. It takes time and thought and anxious waiting to produce one first-class point in an animal, without expecting to produce near the perfect specimen. Artificial selection proves that we can do much in blending characters and qualities—that is, if these characters and qualities were originally in the ancestors, if not we cannot mend or alter what has never been there.

Hereditary characters allow of being corrected or modified by selection; if we have the patience and the knowledge how to correct or modify them. Even the blending of two opposites may be fixed by selection, and may give rise to a new type, colour, or character if not allowed to fail or revert to the original opposites. The longer we watch over the divergence we have made in any breed and the longer the time the divergence has been going on, the more fixed and true the type, colour, or character becomes. The greatest difficulty we meet with, when breeding, or altering for colour, type, &c., is, that in trying to alter or gain one point, we disturb other characters, and may alter more than we require. 'Tis a strange fact in breeding animals that when we attempt to interfere, or alter any quality, or character, the interference disturbs and carries with it some other character or quality—it may be only small, yet this disturbance must be guarded against, and prevented if possible.

When we use fresh blood, it is difficult to prevent this disturbing of fixed characters; the sudden introduction of blood that is too distant, causes a mixing of qualities and characters that would not have been the case if a bird of less distant relationship had been used. If we have made, or fixed, certain characters and qualities in a breed of fowls, and wish to keep or improve them, we must be chary in what changes of blood we use. There must be a blood relationship in the birds we mate together, not a close relationship—although, at times we are compelled to use very close relationship to procure or fix certain qualities or characters. A skilful breeder knows just how closely, and how often, he may use related blood.

Nature is always choosing and selecting the best fitted individuals to live and breed. Man by artificial selection is choosing and selecting the best individuals, and giving them better food, care, &c., than Nature could supply; and man can go further and fix types and colours that Nature would never do, having no occasion to do so, without it would be for the preservation of the animal, viz., changing colour to agree with the surroundings, so that it would be least observed by its enemies. Nature, in her selection, rarely causes changes unless those changes are of use or benefit to the animal; man, on the other hand, often changes type, colour, &c., for fancy or pleasure. What use or profit is the abnormal foot-feathering on our Cochins and Brahmas to the bird or man? What use or profit are white faces in Black Spanish? What use or profit are abnormal combs and wattles in Leghorns and Minorcas? None, in my opinion, being, as in the case of large combs, a daily misery to the bird. If the amount of care, trouble, and worry that is used in producing large combs and abnormal foot-feathering were used to improve the egg-production, table qualities, &c., of a breed, great good would be the result, and I do not think the fowls would suffer through the change, or man miss the large combs and foot-feathering. In America the Light Brahma is numbered among the good egg-producers and table birds, simply because they have been bred for these qualities, and not for the greatest amount of foot-feathering. The American Brahma foot-feathering is not abnormal, but in such a quantity as to show its Asiatic ancestors' character, and no more.

Then comes another question: What would be considered a good point in the male is a fault in a hen, namely, erect combs in Leghorn hens, or it may be in the distribution of colours. In breeds that show an inclination to produce birds with points that are good in the males and are bad in the females, double mating is best—that is, you select a male and a certain number of females to produce pullets (pullet breeding pen), and a male and a certain number of females to produce cockerels (cockerel pen). In this double mating you get better results, for the simple reason you are not asking the birds to produce two fowls opposite in shape, and, in most cases, colour, &c.

This brings us to another point, namely, the strain from which the birds are descended. This is a very important point—more important than most people think. There are certain points upon which breeders are agreed in each breed or variety; but, perhaps, one breeder pays more attention to one particular point than to others. He does his level best for this one point, with the result that his strain is celebrated for this particular characteristic. We see many instances of this, such as large Leghorn combs, yellow legs, white lobes, leg-feathering,

&c. The breeder who once gets this particular point of excellence in his strain is very careful of going away to an unrelated strain for fear of upsetting his pet point.

In mating for size, the hens selected for breeders should be large, as the females have some influence on size and shape of the pullets. The cock has the greatest influence in producing the show points, comb, colour, lobe, &c. It must be remembered that, with all our judgment and care, there is a tendency to revert to some previous ancestor; hence, as I have said above, the necessity of knowing the pedigree of each bird.

In mating for fertility we should mate up good, sound-constitutioned birds on both sides—birds whose ancestors were sound and vigorous. Any bird that has had "roup," or other bad disease, should not be penned for breeding, for the "taint" will be handed down to its progeny. Fertility is diminished when the degree of relationship is too near, as well as when the relationship is too distant. It is a strange fact that in mating birds fertility can be gained or lost. For example, mate a cock of A strain with hens of B strain, this mating may be low in fertility, when, if we mate a cock of B strain with hens of A strain, we get high fertility. So we see what a slight variation will do. Another strange thing: Very often a hen will mate with a cock and 50 per cent. of her eggs prove infertile; remove her to another pen with a new cock, and her eggs will be of good fertilility. Many such slight occurrences I could mention that I have observed and proved in the mating of purebred stock.

In breeding purebreds there must be no "stop" in our work if we wish to succeed; every season should find us still trying to produce a bird as near the ideal as possible. There is no other animal that requires as much "keeping up" as our domesticated breeds of poultry. It is easily understood when we consider the material we are engaged upon. All our purebreds are crosses. Yes, pure crossbreds that we have made into nearly-fixed types. If we let any one of what we call breeds run, or breed, without our care for a few years, what would the breed come to? None of our pure breeds will reproduce as truly as the wild birds. Another why? Because we have not fixed their characters, &c., for "like to produce like" for any great length of time. That is the reason we must still study their mating to keep them from degenerating to the originals. No care or pains can be too great in working up to a good standard of excellence any breed or breeds we take in hand. To be successful we must not trust to memory alone for our improvements; we must dot down for reference every little point or variation we notice in the offspring of our matings. Very often, through lack of noting, we carry forward into next season's work one little fault or blemish that perhaps becomes twice as bad in the second generation. Then we have to go back to get rid of this fault, whereas, if we had noted it when it first appeared in the initial stage, we might have got rid of it.

One great mistake many breeders make is expecting to get rid of half a dozen faults in one season's mating. Now, this is too much to expect, in fact, almost impossible, for fowls are not like a drawing on a slate, that you can rub out and correct at once; you must spend time, thought, and patience to rub out one fault in fowls.

Each cock and each hen has one or more characters—colour, shape, &c., of a hereditary and adaptive kind, with some degree of distinctness. When we study the hereditary characters of poultry, we never find a precise or true—may appear so till properly examined—reduplication, any more so than in other animals. "Of all the millions of human beings upon the face of the earth, no one is so like another that we cannot see some difference; the resemblance is everywhere specific, nowhere individual."—(Romanes.)

"Like will not produce like" only to a certain extent; it will do so with those characters, that are really fixed ones. We have so many characters in domesticated poultry that are foreign or wanting in the original, and which are not fixed, that it is difficult for us to make "like produce like." These made characters are the trouble in mating fowls; it is these "standard called for" points that are keeping our different breeds separate and of what we call a pure variety. We must always be using the art of selection or mating to get to the proper standards laid down for each breed if we wish to keep distinctive characters.

The difference between artificial selection and natural selection is,—First, in the case of artificial selection, the selecting agents are our brains, or, I might say, we have in our mind's eye what we want to produce; while in natural selection the selecting agents are the birds themselves, or Nature. Natural selection if given its way, will lead us back to—what? Not to the original wild fowl, but to a class or variety that will in time become of a uniform colour, and a variety that will lay one or two sittings of eggs a year. A strange thing with artificial selection, the birds, closely as they may resemble this variety that has become a natural species, present two conspicuous and important differences: First, their egg-production is greater, and shows more fixed characters; second, they rarely present the mutual infertility which is common in the natural species. For instance, we are breeding from birds that have been built up by artificial selection, and are still keeping them up to a certain standard of points. These artificially selected and made birds will not show infertility or fall off in egg-production if managed properly. Where selection is perfectly natural as, for instance, it would be in the case of a flock of fowls—any breed—allowed to run and mate according to their own sweet will, the birds will in course of time become smaller, be able to fly further, lay less eggs—probably a single setting—and show a degree of infertility that our artificially selected do not. What do we learn from this? That we must watch carefully our selections—not to follow Nature altogether—unless we want poor egg-producers and small market-birds.

As to the number of hens that should be mated with a cock for good results, many breeders differ—much will depend on the breed, the bird's vitality, and the season of the year. One of those "little strange things" I spoke of above comes in here. It is that we can mate too low a number of hens with a cock as well as too many for fertility. At the beginning of the season five or six hens are sufficient, and as the season advances may be gradually increased up to nine or ten for the lighter breeds. For the heavier breeds three or four hens in the early part of the season and, if a lively, vigorous cock is at the head of affairs, as many as six or seven may be put in as the season advances.

In mating for egg-production never forget that you want the cock to be a descendant of a good laying hen, as well as the females he is mated with. I have often been asked the question, "How to mate up a good breeding-pen?" and must confess that I have often advised what is nearly an impossibility—and that is, to pen standard birds every time. The proper answer should be to select the hens to a uniform type with as few faults as possible. Have the cock as near perfection as you can, having no faults that the hens have, and if possible a distant relative to the hens—not too far removed. When using unrelated blood you are not sure what your progeny will turn out. By using related blood you have less to fear from variation, therefore are a little more sure of what your progeny will be like than if you mated too remotely.

As to the age of birds in breeding-pens, I found the best results from two to three year old hens, mated with cocks one or one and a half years old. If you must use pullets in your breeding-pen, it is always best to use cocks two to three years old.

I might state that we have a lot to learn to get a high percentage of good birds from our matings. Time also will be used in experimenting—for I can call it nothing else—we cannot say for certain that we are going to make "like produce like," for they won't. It means years of thought and labour to get near perfection in breeding most thoroughbred varieties; and with all the years of experience in breeding for standards we cannot say that we can produce 50 per cent. of first-class birds from any variety.

What are the rules generally followed in breeding thoroughbred poultry? There are very few as far as I am aware; most breeders think it sufficient to introduce "fresh blood," or purchase a first or second prize bird now and again, and all is done. Some import good birds, and mate them with improper mates perhaps, and trust to chance to bring them good layers or exhibition birds.

This is not the proper method of breeding purebred stock—there must be brain work used in the mating of the males and females; there must be a knowledge of the ancestry of the birds you are working with. Men have bred birds that have gained the judge's eye—but 'twas by accident; the parent birds themselves produced them by accident—and on examination of the flock there would be found no uniformity in the brothers and sisters to show that skill had been used in producing them. I have seen an almost perfect-looking Duckwing Game cock, that received a first and champion prize, purchased at a show for a good price to be used as a stud male; this bird's mother was nearly a full-blood Silver Grey Dorking.

Haphazard or breeding by chance may do for breeding mongrels or "wasters," but when we wish to breed thoroughbreds, and keep to good breeding lines, and know what we are doing, we must know the lineage of the birds, and use good ink and paper to keep a record of them. It seems to me all the pedigree that is required, or looked for by many poultry-breeders, is "show cards." They are a stamp of quality certainly, yet a bird with the highest honors of the show-pen is worthless unless we know his parents' and ancestors' qualities for breeding to type, colour, &c. We seldom hear a purchaser inquiring for the pedigree of a bird, yet cattle and horses, and even dogs, must show a pedigree or record of their ancestry if they are to be called thoroughbred, and bring purebred prices.

Dairymen, nowadays, have forgotten the old methods of "bailing up" cows or heifers bred by accident; they look for animals whose parents or ancestors have a pedigree or record for producing so much milk, or testing so much butter-fat. The up-to-date dairymen have found out that it pays to keep stock that have been bred carefully on selected lines. They all agree that it costs no more to keep the pure breed than it does the cow bred by chance or accident.

Horse-breeders are proud of the aristocratic tabulated pedigree they can show you of their thoroughbreds. How anxious they are, when the mating season comes round, to secure the services of the sire that "nicks" (this word, in my opinion, really means that there is a distant or some relationship) with such and such a mare. What would we think of a recognised breeder of racehorses going to the show and purchasing a sire because he received a first prize ribbon in the show ring, and mating him with his best mares, regardless of his pedigree? Yet this is what is done in the case of poultry.

Sheep-breeders have their pedigree-books to enable them to keep records of animals that produce fineness of wool, length of staple, &c., as well as other qualities. Dog-breeders have their stud-books also to keep them from going astray from the aristocratic line that produces proper markings, shape, &c. But the easy-going poultry-breeder's stud-book is—well! a first prize show-card; that does him for all time.

The breeding of birds for exhibition purposes will always be done, and I have never condemned it; but I do not believe in the methods most breeders use in trying to produce show birds. I maintain that it is to these breeders the general poultry-keepers are to look for fresh blood and typical birds, and it is the duty of the thoroughbred breeder to mate his birds properly and to keep a proper record of their pedigree.

I am of the opinion that we should use two kinds of line-breeding for poultry, for the simple reason it is expecting and asking too much of a pair of birds to produce standard show colours, combs, earlobes, wattles, &c., as well as producing good egg-producers, good table birds, and good quick-growers. I would advise a pen on the line system for standard show points—colour, size, type, &c.—in fact, to breed for perfect specimens of the breed as near as possible, at the same time keeping up to a fair egg-production. The second pen bred on the line system would not be so difficult. We would only ask for egg-production, size, table qualities, and a fairly uniform colour.

Nowadays the best and most useful breeds are trending towards a uniform colour, good table birds, quick growers, and good egg-producers, so that it only means time when four or five of our old breeds will disappear or be kept by very few. I predicted this some five years ago, and said at the time that, if we wished to refresh our memory with what the birds looked like, we would be compelled to search for them in a museum. We have only to remember the fate of the good old egg-producing Black Spanish; but in this case the new varieties will combine the qualities of good egg-production and good table birds, while the old varieties were only egg-producers. The breeding for white face and exhibition points ruined the Black Spanish; but with our modern general-utility breeds there will not be so much to be sacrificed or so many difficult points to gain, as the type to breed for is not so complicated.

Reversion or Degeneration.

Reversion is one of our accepted facts in breeding birds, as well as animals; at times it may be of value in reproducing lost or dormant characters that may have been of value or use. Generally, reversion gives the inclination to revert to previous ancestors, or to the original, or wild, worthless forms. If we allow one of our choice breeds of poultry to breed and inter-breed as they choose, the result will be reversion or degeneration. The shape, colour, type, and qualities of the breed were fixed—to a certain extent—by domestication, care, and food. When we neglect to carry on, or keep up these influences, degeneration is the result. Degeneration, or this "throwing back," is very easy, give it the least chance or opening, and it will destroy any other qualities that we are striving to keep or fix; and when it does start on its retrograde course, it travels fast to the original characters and form from which we have raised it. Every male and every female that we pen as breeders have the irresistible force of reversion, urging or impelling them to revert or "throw back." When we consider a moment, it is easily understood why this is the case. The ancestors of our domestic fowls have had their hereditary characters fixed—generation after generation—little variation being found in long series of years that must have elapsed since the first fowl appeared in Asia. Man has added so much to the original fowl—such as feather markings, shape of combs, crests, leg-feathers, size, &c., most of which—if any—are of no essential value to the existence of the fowl, that it is difficult to keep the bird up to these new characters. Originally the fowl had few characters to "keep up," or hand down to its progeny, but nowadays we ask for ten times more; so it is no wonder we cannot reach the ideal, or the 100-point bird in breeding.

It is wonderful how quickly a fowl will degenerate, and fail to develop itself, or even to keep to colour and type; it deteriorates and becomes more and more adapted to a lower or degraded form of life. An interesting case came under my notice some years ago. It was on a deserted selection; the owner having failed to make a living on it, deserted it some four or five years before my visit—according to the nearest (8 miles) neighbour. I was told by this nearest neighbour that there were scores of fowl gone wild at this deserted selection; the original fowls could not be caught when the owner left, as the birds were in the habit of roosting in the trees. Our shooting party consisted of four, and sure enough we found the fowls in a scrub close by the old house; two of the party managed to bag seven—three cocks and four hens. I managed to get a glimpse of a few as they ran along the ground or took to wing from cover to cover, but failed to shoot any. I examined the birds shot very closely, to try and decide the breed they originally were descended from, but failed; two of the cocks showed signs of the Game breed, and slightly feathered on the legs. In colour the cocks showed most black and brownish-red in the plumage; the hens were darker than the cocks, and had more or less reddish-brown in their plumage—not one showing the least sign of white. In size they about equalled our Pencilled Hamburg variety, but were longer in body, neck, wings, and legs. I had the opportunity of seeing a cock of those wild fowl flying fully 200 yards before it alighted on the other side of the creek. There could be no doubt about their wildness; they were as wild and as difficult to approach as the wild pigeons that shared their retreat. The neighbouring selector told us that he often searched for their nests, but never found any—but has seen the hens with a brood of chicks, numbering about eight or ten. It would have been interesting to have watched the life of these degenerating domestic fowls; also to have known the name of the pure breed or breeds that they were descended from.

Inheritance.

In mating birds or animals, the choosing of the individuals must be carefully done; we should know, or have a very good idea of, what they are likely to produce or have inherited from their parents or ancestors. Darwin says: "It is hardly possible, within a moderate compass, to impress on those who have not attended to the subject the full conviction of the force of inheritance, which is slowly acquired by rearing animals, by studying the various treatises which have been published on the various domestic animals, and by conversing with breeders."

It is really wonderful how long this gift of inheritance will lay dormant in a breed. I remember a case that happened in a pen of Dark Brahmas I owned. This pen consisted of five hens and a cock, the cock being a descendant of a Dark Brahma male and Silver-grey Dorking hen, fully seven generations back. After the second year's work with birds from the Brahma and Dorking, few came that were not well leg-feathered and four-toed; the third and fourth years' gave 90 per cent. of good type Brahmas; and the fifth and sixth years' showed no trace of the Dorking blood. About the seventh generation a nearly clean-legged and five-toed bird cropped up to remind me of the Dorking blood introduced fully seven years previously.

It is usual to refer all unusual qualities of type, colour, &c., to accidental causes. This is wrong; for natural laws or scientific breeding ignore accidents. The results of scientific or natural laws are generally uniform and regular; the apparent uncertainty or accidents that we meet with generally arise from our imperfect knowledge of the above laws. We meet with many unaccountable results in breeding animals, but if it were possible for us to trace back generation after generation we would be enlightened by finding what caused the strange results. Constitutional diseases have lain dormant for two generations and shown in the third, which was the case in a strain of Australian Game I once kept.

Old characters, no matter of what quality, will persist as long as we allow those characters to predominate in the male or female; the persistency must be broken or made to disappear, if a bad character, by selection. There can be no doubt that birds inherit physically the good and bad points of the parents, individuals of the offspring preponderating according to the power of either parent over these qualities. Climate affects fowls. Young birds, when imported from England to Australia, increase in size, and their descendants will be larger in size than the parents.

Sexes.

Much has been said and written on how to regulate the sexes; well, up to the present, I have not heard that it can be done for a certainty. In my opinion, if we take one year with another, and analyse the correct statistics for any animals produced in a season or year, we will find that the sexes are nearly even. If we take the total chickens hatched in a season—early and late—one year with another, we will find the sexes about equal. We may find one pen or breed that give us a majority of males, or it may be a majority of females; why such is the case 'tis very difficult to say. As to producing the sex we wish, it cannot be done until the "law of sex" is discovered in the higher animals. We can regulate the production of males or females to a certain extent by mating vigorous young males and vigorous hens early in the season, the result generally being an excess of males; but if we breed on till the end of the season with these birds we will find the females to be in the majority towards the end of the season, making the sexes merely even for the whole season.

In poultry-breeding 'tis not uncommon to have hens—one producing a majority of males, another producing a majority of females; but why it is so, is difficult to say, for the male bird has to be considered. I held a theory at one time that nutrition may have had something to do with sex; I got the idea from the bee that changes an egg which in the ordinary course of events and feeding would produce a worker or neuter; but fed a richer food produced a reproductive female. After studying this strange, though common, occurrence, I wondered if the generation of sexes in birds were affected by nutrition—the mother—having an extra amount of food nutrients to store up for the growth of the ovary, and stores of rich nutrients in the egg for the growth of the embryo chick. But when science stepped in to inform us that the chick is a neuter and hermaphrodite during some days of incubation, I gave up the food theory. Though science tells us that such is a fact, scientific men cannot tell us the cause, or why such is the fact; therefore, it would be useless for the every-day poultry-keeper to trouble himself over the question.

Some people go as far as saying "that they can tell the sex that each egg will hatch out." Up-to-date breeders know that this is an impossibility—for, as I have said above, the sex is not determined till some days after the commencement of incubation; in fact, the embryo chick—if it had reason—for the first few days of its life would not know whether it would be a hen or a rooster.

Power of the Sexes.

It has been stated by many "that the male has the greatest power in transmitting certain characters, qualities, &c." I admit that he has the power for transmitting certain characters, but not as many as some people would have us believe. I have careful notes on this subject taken during the last twenty-five years; and during the latter half of that time; I made extra careful and exhaustive records, and found some very strange facts. In the first place, I proved that the female handed down disease quicker than the male; and when we consider, it is only natural that it should be so, for the formation, part of growth, and food of the embryo is supplied by the mother—in fact, we might say part of herself for a certain time. I have found that if a pullet or hen had roup, the disease would show in many of her offspring; even liver diseases are handed down. Pullets or hens that have been extra good layers will hand down the quality of egg-production to 70 per cent. of their offspring—all will not be good layers, as some people imagine. Individual hens may produce as high as 90 per cent. as good layers as herself, while others will not produce more than 50 per cent. The reason for this is variability—this departure from the mean character or qualities of species is found in all animals. 'Tis not uncommon to find offspring differing from their parents, and showing or giving us types or qualities of ancestors of a foreign type. From my experience, I found that the male and female powers of transmitting the following qualities are, in points—using a maximum of 10—about the following:—

	Male.		Female.
Comb, face, lobes, and wattles	6	to	4
Colour and shape	7	,,	3
Carriage and symmetry	8	,,	2
Constitution and egg-production	4	,,	6
Size and growth	5	,,	6

Of course, I do not wish my readers to take the above figures and apply them to every male and female, or expect that the powers of all males and females are exactly alike or the same as above. The figures given here are the closest average that could be struck from years of records that I have kept. We may get individual hens that have powers totally different to the above average. At the present time I have a hen in her third year, that I would score for transmitting size, a full 8; yet, if I were choosing birds for a breeding-pen, I would pick the birds by the above figures. In mating up a breeding-pen, we are compelled to use what we have on hand; besides, every male, or every female, will not produce the same number of qualities or characters as another male or female may produce. This is the trouble: "How to get the best possible results from the birds we mate together." By knowing, or having a good idea of the power of the sexes, the matings are made easier, and we may expect pretty fair results. For instance, we have a hen that we expect her powers of transmitting comb, face, lobes, and wattles, would be valued at 5, mated with a male whose power to transmit the same characters is only valued at 4. The results from this mating would not be bad; but would have been better if the male had scored, or had the average power of 6 to transmit the characters mentioned.

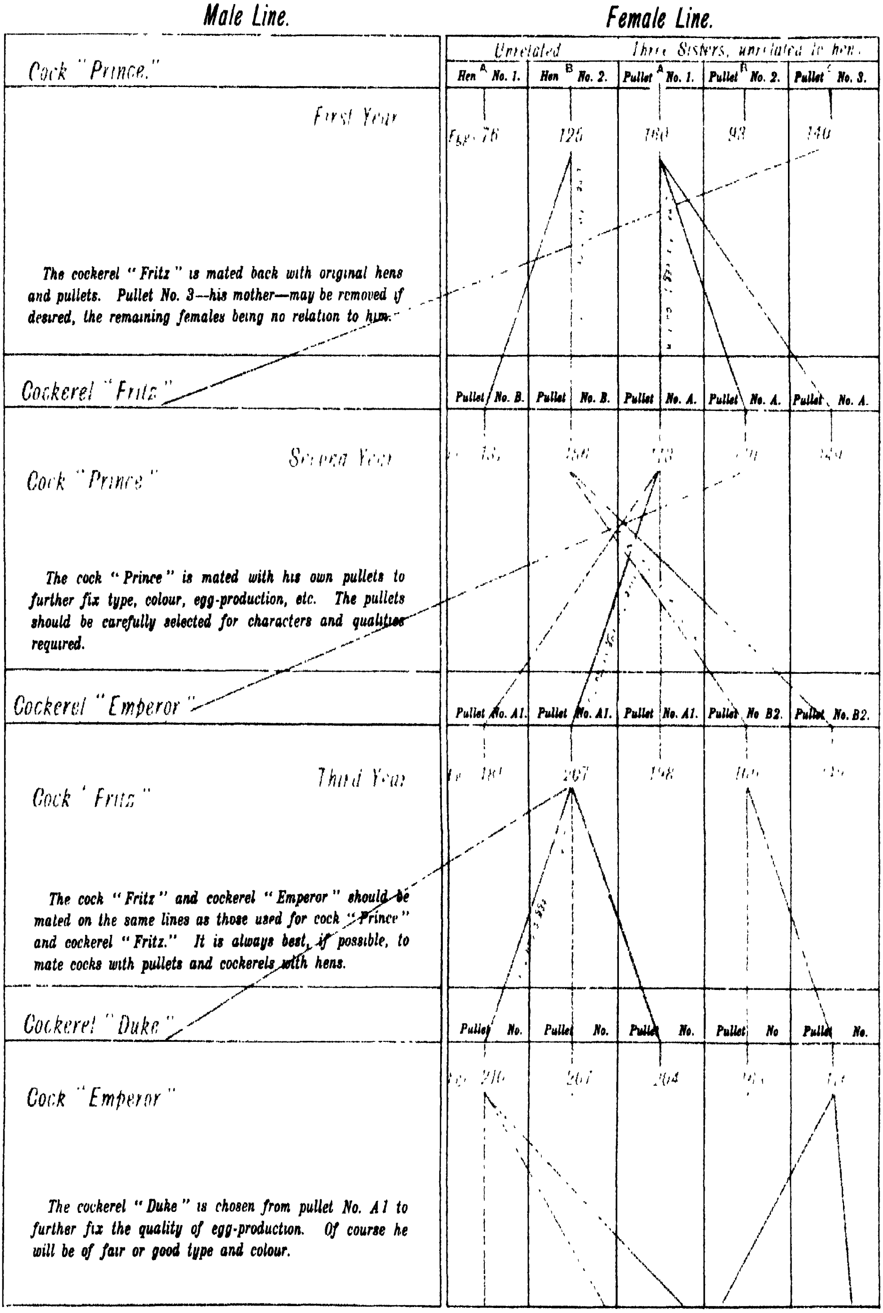
Line-breeding.

We often hear the questions, "What is Line-breeding?" or, "How do you breed Pedigree Poultry?" Before I endeavour to explain or answer the questions, let us first see what "breeding" means. The word itself means "the act of producing." But we must not be satisfied with that definition; we must add a little more if we wish to understand the word thoroughly. Breeding also means the art man uses in producing a variety or breed; it also means the art or science that man uses in changing the condition of life of an animal or plant, and the regulating of colours, shape, size, qualities in the reproduction of animals. Now we come to breed—what does "Breed" mean? On referring to a dictionary we will find, "to generate or bring forth; kind or race." Therefore, a breed means a race, group, or variety, so marked, and that have certain characters which they can hand down or transmit to their offspring. If the parent animals cannot do this, then they are not a true breed. Remember, I wish it understood that the slight variations due to all breeds do not debar the parents from being a true breed.

The birds or animals that hand down or transmit the closest resemblance in colour, shape, qualities, &c., to themselves are those entitled to be called thoroughbreds, or pure breeds. A breed should fulfil to a certain extent "like to produce like"—if not, then it cannot be classed as a pure breed until it does so. All breeds must have the power of transmitting the colour, type, qualities, &c., of the parents or ancestors to their offspring. The purer the breed, or longer the breed has been "fixed," the more even and better the results. To keep a breed pure we can only take one solitary road to success—and that is, to select the best individuals in each generation and mate them together.

Line-breeding is another name for mating the picked individuals together in expectation of certain results, and keeping a record of each generation. This question of line-breeding is of great importance to the purebred poultry-keeper, as well as to other purebred animal breeders. I am sorry to say there are few, very few, poultry-men to-day that can show you a properly kept stud-book of their thorough-

LINE BREEDING.



The cockerel "Fritz" is mated back with original hens and pullets. Pullet No. 3—his mother—may be removed if desired, the remaining females being no relation to him.

The cock "Prince" is mated with his own pullets to further fix type, colour, egg-production, etc. The pullets should be carefully selected for characters and qualities required.

The cock "Fritz" and cockerel "Emperor" should be mated on the same lines as those used for cock "Prince" and cockerel "Fritz." It is always best, if possible, to mate cocks with pullets and cockerels with hens.

The cockerel "Duke" is chosen from pullet No. A1 to further fix the quality of egg-production. Of course he will be of fair or good type and colour.

bred fowls. The majority depend on their mental capabilities to trace the pedigree of their stock. Now this is a grave mistake, for after a few years of breeding none of us can give the exact pedigree for a number of birds without having it in "black and white." Birds that have no records kept of their lineage, beyond what a man's memory holds, are not of great value; it would be just as good as saying: "That bird is by Accident out of a Waterhole" for all the usefulness or value such a pedigree would be.

The chart shown is one that I invented and used for the last fifteen years in breeding thoroughbred stock. I tried other charts and ideas, but found them too difficult to follow, and not of sufficient clearness to follow for any number of years, without you used the chart for a whole family or group. It was the individual male and female that I wished to trace and keep the lineage of, and found the rules given in this chart the simplest and easiest to follow.

On the first glance it looks a Chinese puzzle, but it is no puzzle, nor is it difficult to follow once you get the idea of it. It would be wrong for me to think that it is perfect, or that there is no other method of showing a chart or diagram of line-breeding. But to those who may know of other charts, I would suggest comparison with mine, and I am almost sure they will admit that mine is very simple and easy to follow. I have studied over a score of methods used by breeders, but not one did I find that showed—in a simple manner—the lineage in a direct line back to the original parents. Anyhow, I tender the chart below in hopes that it may be of assistance to breeders of thoroughbred stock; or that it may be the means of producing a better idea or chart.

The chart of line-breeding can be used for recording the pedigree of families, or groups, as well as individuals. Those males and females that are chosen for breeding-pens may be booked by recording—name of sire, and name or number of female that they are descended from—marking, or ringing the young stock, so that whenever you pick up a bird you will know by mark, or ring, the sire and dam at least.

The second years' breeding should give the formation, or starting-point, for two pens of different blood relationship; and by carefully watching and selecting the relationship you can go on for years without foreign or fresh blood.

If the chart and recording is kept carefully, the careful breeder will build up a strain of his own; one that there will be no chance or accident about. He may have commenced operations with very poor specimens; but selection, time, and patience will bring him pleasure and profitable returns for the care spent.

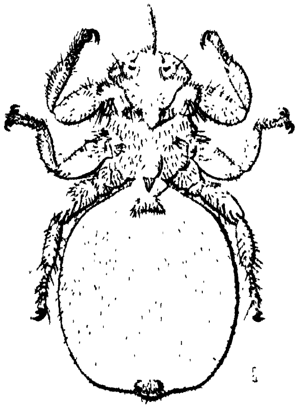
Spider or Lice Flies that infest Horses, Sheep, and other Animals.

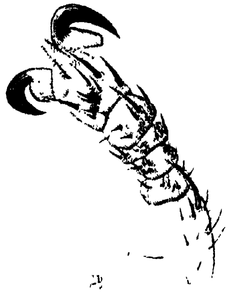
By WALTER W. FROGGATT,
Government Entomologist.

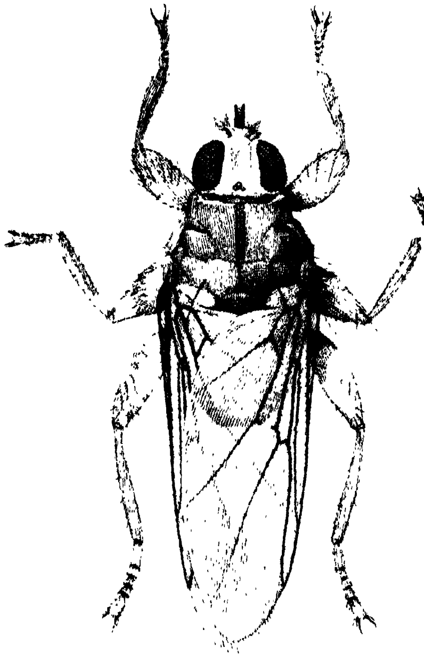
AMONG the many interesting groups of the Order Diptera, which includes all the two-winged flies, are several that may be called degraded or retrograde types, which, in adapting themselves to their peculiar manner of life, have greatly developed some organs through constant use, and in a like manner lost or aborted other portions of their anatomy through want of using them. Some have wings in the adult state, but, as in the case of the red deer fly, they have the power of cutting or casting them off; others that have reached a lower depth of degradation, as the "sheep ticks," never have any wings. The lice flies—sub-order *Pupipara*—are remarkable in other ways, and take their group name from the fact that the egg undergoes the earlier stages of its development in the body of the mother, and is only laid just about the time that the fully-developed larva is changing into the pupa, and forms a solid pupal case when deposited among the fur or feathers. The adult flies are short, flattened creatures, with the thoracic segments fused together, and the abdomen broad, and rounded at the extremity; the head is narrow in comparison with its length, armed with short, two-jointed antennæ, springing from a little pit in front of the head, and the mouth formed into a suctorial beak or tube by the joining together of the mouth parts. The legs are frequently very long, with tarsal claws, very large and peculiar in structure, but admirably adapted for clinging and holding like a pair of forceps to the skin of their host. Those that are furnished with wings, though their venation is very simple, fly readily when disturbed; but, as a rule, trust to their legs, and are very active creatures, so that it is difficult to catch them.

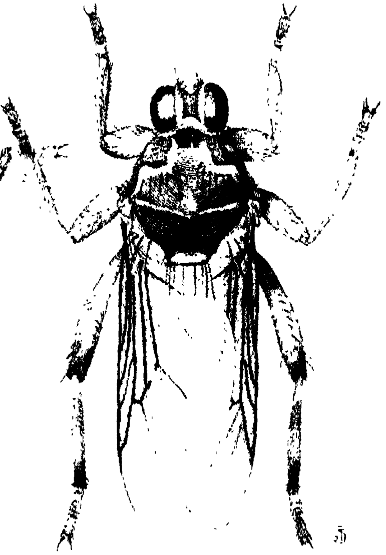
The family *Braulidæ* is represented by a single species, *Braula cocca*, a tiny, little, brown, wingless creature, almost blind, that lives upon the body of the honey bee, and is supposed to gain its living by pricking the abdomen with its sharp, style-like mouth. This curious little parasite is known in Europe as the "bee louse," but, as far as I am aware, it is unknown to Australian beekeepers.

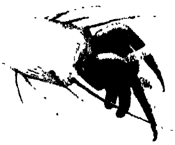
The family *Hippoboscidæ* contains a number of flies that live among the fur and feathers of animals and birds, though they do not seem to irritate the creatures upon which they habitually dwell, for it is stated that they frequently cluster in hundreds upon the wild ponies and cattle without the animals taking any notice of them; yet animals that are free of these parasites show signs of great fear when they come

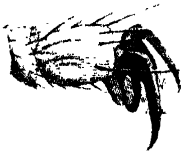












LICE FLIES

into an infested district, and go almost frantic when the insects settle upon them. This is probably caused by the unpleasant sensation caused by the tickling and pricking of their sharp claws more than fear of their bite.

Their wings are very variable, sometimes large and parchment-like in texture, with very stout nervures traversing the basal portion of the wing, but never extending to the tip; other groups have the wings small and semi-aborted, while a few are wingless. This family is divided into a number of genera, but most of the distinctions are rather slight, from the general observer's standpoint, and I will omit them, and give a few notes upon the typical forms. In our Australian species little or nothing has been done in regard to working out their life-histories or identifying the flies with the particular bird or animal they infest.

The Forest Fly (*Hippobosca equina*, Linn.)

This species is common in Europe, and is also recorded from the Canary Islands and Africa. I have found no notice of it being in America or Asia. Miss Ormerod has recently described its habits in the south and west of England, where at times it is very plentiful, and a great nuisance to horses travelling through the infested districts. It was first recorded from the New Forest in 1781, and Miss Ormerod's report deals with the plague in Wales, Hampshire, and Dorsetshire in the summer of 1895.

The fly measures about a quarter of an inch in length from the front of the head to the tip of the body, but the tip of the wings, when laid flat upon the back (the usual position at rest), extend well beyond the abdomen. The general colour is dark-brown, shaded with tawny yellow; the whole of the outer surface (integument) is thick, leathery, and shining, with the legs and outer margins of head, body, and legs clothed with stout hairs. The eyes are large, and occupy the side of the head; the antennæ short, and sunk into pit-like depressions in front of the eyes, rounded at the tips, and surrounded with two bristles.

In 1895, Mr. H. Copeland (our present Agent-General) paid a visit to Noumea, New Caledonia, and upon his return wrote a most graphic account of a fly, or "flying tick," which drove horses and cattle frantic in that country. This insect, he was informed, had been introduced from Algeria some six years before, and had since that date spread all over the island. He drew attention to the fact that the introduction of this fly would be a very serious pest to stock-owners in Australia, and said that the Government of New South Wales should send over one of its most capable scientific men to Noumea to study the habits of this insect, and get some idea how to deal with the pest. He stated that it was a little larger than the house-fly, and gave a very good description of its general form and habits; but a few days after publication of Mr. Copeland's report, one of the Sydney newspapers reproduced a figure of this fly over 2 inches across the outstretched wings, with a statement that the illustration was half natural size, so no wonder that Sydney people considered it a formidable beast, 4 inches across the wings, after Mr. Copeland's account of its infestation of stock.

Nothing more was noted about the "flying tick," though it is probably as plentiful as ever in New Caledonia.*

Early last month Mr. E. Stanley, Chief Veterinary Inspector, brought me a couple of dead flies which he had captured upon his pony after the animal had been in company with a horse recently imported from Noumea. From the antics and fright of his pony when placed in the stable, he soon discovered these flies running over the skin, but they were so quick hiding under the tail and legs, that it took his groom a couple of hours to catch them. With Mr. Copeland's account in his mind, he concluded that these were samples of the so-called "flying tick," and brought them to me for identification.

At p. 1093 will be found Mr. Stanley's detailed account of the discovery of the fly at Quarantine Station.

Other Forest Flies.

In Africa *Hippobosca rufipes* is found upon the quagga, though it was first recorded as being taken upon the wild ostrich by Wiedman; but other travellers found it upon the former host, and as these birds and animals intermingle in the wild state, the pest probably passed from the quaggas to the ostriches. Another species, *Hippobosca struthiones*, is a very common species among the domesticated ostriches in South Africa, and where they are numerous cause the birds great annoyance, while the birds pecking at them damage their feathers so much that they are spoilt for market. This seems to be a very distinctive species, of a dark-brown colour, spotted with yellow, and is described and figured in Miss Ormerod's Observations on some Injurious Insects in South Africa, published in 1889.

The camel fly (*Hippobosca bactriana*) is described by Rondani from Persia as a well-known parasite upon camels, and another species under the name of *Hippobosca ægyptica* is recorded by Macquart from Egypt; as we have many camels working in the back country it would be interesting to find out if their fly parasite have been introduced with them to Australia.

The common dog fly (*Hippobosca canina*, Rondani), according to Rodani, is very common upon that animal in Italy and other parts of Southern Europe. There is also a plentiful supply of a "louse fly," said to be this species, that swarms upon the pariah dogs in the villages in India.

India is the home of another species (*Hippobosca maculata*) which takes the place of *H. equi*, and attacks the horses in a similar manner.

In the genus *Olfersia* we have a number of species that are found both upon animals and birds, and only differ slightly in detail from the former group.

The wallaby fly (*Olfersia Macleayi*, Leach). This is our commonest species, parasitic upon several of our wallabies in Victoria and

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* There are two indigenous species of *Hippoboscidæ* described as from New Caledonia by Mr. J. F. M. Bigot in the Ann. Soc. Entom. of France, 1885.

New South Wales; in the Australian Museum there are specimens taken upon *Halmaturus ruficollis* and *H. perryi.* In the National Museum in Melbourne there are a considerable number from undetermined wallabies, and I have received a fine series of specimens from Port Macquarie, New South Wales, sent by Mr. Brown, who states "that it infests all the wallabies in this district, and that sportsmen always know when their dogs return to them after a hunt if they have killed a wallaby, for whenever they kill they return with some of these flies crawling over them."

This fly measures slightly under half an inch in length, from front of the head to the tip of the wings. The centre of the head is pale ochreous; the eyes dark reddish-brown; thorax dark brown shaded with yellow, with the legs brown deeply shaded with green, and claws black; abdomen, brown; wings, pale fuscous (grey or brownish-black) with nervure quite black.

The head in front of the eyes is produced into a divided or pronged process, with the short, stout, two-jointed antennæ half hidden in a pit on either side, from the tip of which springs a stout bristle; the whole insect is very much flattened and clothed with stout hairs, those upon the dorsal surface scanty, but very dense upon the abdomen. The head is rounded in front and on the sides, slightly acute behind with the eyes large, elongate, and somewhat angular in front. The thorax is flattened, smooth, and shining, with a few stout bristle-like hairs, and a pair of small oval plates covered with short spines which extend down the centre of the back. The legs are moderately large with the tarsi somewhat short, thickly spined, and terminating in a pair of hooked claws. The wings are comparatively long, rounded at the tips. The abdomen is somewhat heart-shaped, but broader at the apex and slightly lobed.

In Skuse's list of these flies (Records of Australian Museum, Vol. II, p. 5, 1893) this species is given with "host unknown."

The pigeon fly (*Olfersia spinifera*) is well known on these birds in Europe, and is also said to occur upon pigeons at Port Elizabeth, South Africa.

The grouse fly (*Ornithomyia avicularia*) is common upon these birds in England. This is a much smaller insect than the horse fly and differs in the structure of the claws of the feet, but in colouration it is very variable. It is said to infest a number of the forest birds as well as the grouse.

The fly that infests the red deer (*Lipoptena cervi*) has been figured and described under half a dozen names, and one of the reasons for this is that though the perfect fly emerges from the pupal stage with wings, it very soon afterwards bites them off, and the female is such an adept that she is seldom found with her wings intact, so that the earlier entomologists, not understanding their habits, looked upon the sexes as different insects.

Coming down the line from the fly that has wings, but divests itself of them as encumbrances, we come to one that is destitute of these appendages.

The Sheep Tick (*Melophagus ovinus*).

This insect is too well known to farmers and squatters to require much description, but it is probable that very few have any idea of its life-history.

To commence with, its name is misleading, and it would be much better described as a "sheep louse" or "louse fly," as it is a true fly; and an examination of the thorax shows stumps where the wings should be even in its aborted state. The name tick often causes it to be confounded with true ticks, which have four pairs of legs and no thorax, and are not true insects, but more closely related to spiders. Popular writers sometimes make this mistake, and in the last edition of "Hogg's Microscope" this insect is figured as a true tick. It has a wide distribution wherever sheep are bred. Curtise says that it was introduced into America from Europe, and probably came to Australia in the same way. In Scotland, Miss Ormerod says they are known as "kades" or "keds." In Australia it is very common, and among old sheep, rams in particular, when poor and poverty-stricken, they are sometimes very plentiful; and after shearing, when they lose the shelter of the wool, they crawl on the unshorn lambs, and cause them a lot of annoyance. But as, on account of the grass-seeds, the lambs are generally shorn after the sheep—in the western country, at any rate—they do not do very much damage; still, as Curtise points out, anyone who has let a sheep tick bite him can well understand the pain and discomfort they must cause young sheep and lambs.

The insect in general appearance is more like a dark-brown, short-legged spider, measuring under a quarter of an inch in length, with a short, flattened, hairy body. The head is a little broader than the thorax, which is almost square, and fits close into it, with short antennæ buried in pits on either side of the face; the mouth produced into a tubular process, which it stabs through the skin and sucks up the blood; and the eyes very small. The legs are stout for their length, covered with stout bristles, and armed at the extremities with two stout claws; and the last joint of the foot bears a curious feather-like organ, probably used to help the claws holding on to the wool. The abdomen is flattened, contracted at the base, and bag shape.

They crawl freely about among the wool, only attaching themselves to the skin when sucking up the blood, and are more slow and sluggish in their habits than other "forest flies."

The females produce their larvæ in flat, rounded, chestnut-coloured pupa cases. Some authorities say that each female produces only one or two of these cases, but other writers say up to eight. These are laid, one at a time, among the wool, and attached to it by a sticky substance deposited at the same time as the case; the perfect fly emerges through the end of this case, which is protected by a little cup or lid. In some countries sheep are regularly dipped for this parasite, but this is exceptional in Australia.

Conclusion.

In the different Australian Museum collections I have examined a large number of undetermined specimens taken from our native animals and birds. The parrots seem to be very much troubled with them. A friend in Victoria informs me that the king parrots about Melbourne sometimes swarm with them. Four different parrots are credited with these flies in the Australian Museum, and two in the Melbourne Museum. The laughing jackass, the dollar bird, Swainson's fruit pigeon, two different owls, several hawks, two finches, two fly-catchers, and another on the emu wren, which was described, under the name of *Ornithomyia stipituri*, by Schiner in "The Zoology of the Voyage of the 'Novara' in 1850," collected in Tasmania. Skuse has listed six other Australian species, but in all of them the host is unknown.

NOTE BY MR. E. STANLEY,

Chief Veterinary Inspector, Health Department.

SOME time ago a diminutive showman, named General White, visited this Colony, being a passenger from Noumea. He brought a very little rough-coated pony; the animal had to pass through quarantine; he was a quiet listless pony, and never showed any symptom of being the host of the much-dreaded *H. Equi* flies. However, a few days after he left, an old pet pony, kept for family use at the quarantine, camped in the same stable, and became the unwilling host of four flies left by the Noumea pony. The discovery was made after the quiet old pony had been dangerously cranky for two or three days. She was restless in the stable, stamping the floor and kicking the walls. At first this was thought to indicate an attack of spasmodic colic, as the paroxysms were intermittent; beyond dieting carefully, no medicinal treatment was deemed necessary. Next day I drove her about 6 miles; she now and then became very irritable, and on pulling up began kicking and stamping frantically. I watched her closely, and soon recognised it was not colic, so I examined all the harness, thinking, perhaps, that something chafed her. I could find nothing and returned home, being satisfied the irritation was caused by some external agency. I asked the attendant to examine her carefully. He could find nothing; as plenty of house flies were about, he suggested they irritated her, but the paroxysms of irritation were too intense for such an explanation. Next day the pony was driven in a phæton, and a quarter of a mile from home behaved so violently that the occupants had to get out and walk; the groom led her back home, dreading her smashing the vehicle by her vicious behaviour; fortunately she cow-kicked, lashing out one leg, then the other, using her tail furiously, apparently at some imaginary spook, as she did not attempt to injure the vehicle, to get out of harness, or escape from control. This going on day after day, I felt puzzled by such extraordinary antics of such a docile pet, and concluded that something must be irritating her skin, and determined on finding the cause. Watching her carefully in the stable, I noticed several house flies settle upon her, of which she took no notice. Suddenly she began kicking and lashing her tail furiously; then I noticed the peculiar jumping movements of a fly (not unlike the common house fly to casual observation), hopping like a frog on the mare's skin, and every time it alighted she resented by stamping and kicking. I said to the attendant, "We must catch that fly." It was not easy, as its movements were very rapid, and the mare equally restless; however, at last a smart hand-slap killed the fly on her skin. Closer examination quickly showed the fly was a stranger to me; it was shorter and stouter in body and wings, different to the common fly; so we searched for more of them that might be secreted under her thighs or arms, and were rewarded, for, on lifting her tail, two were found on the hollow close to the anus; they popped out on seeing daylight, and we had to clear out of reach of the pony. We tried to secure these alive, as I suspected their identity with the Noumea horse-pest fly, so graphically described by Mr. Copeland in a Sydney daily paper after his troublesome experience with them in New Caledonia. After considerable trouble we secured one alive and one damaged; another good specimen was captured alive after three or four hours' patient hunting. The activity of the flies was marvellous; although they would leave the mare for a time and hide in the stable, again and again they returned to their host, until all were caught; from that moment the pony had peace. She occupied the same stable for weeks, but no other fly troubled her, and so the pest was stamped out. As I could find no evidence of fly-bite, no swelling or soreness, as is found on the skin of the horse from mosquito bites, horse flies, and ticks, I examined the fly under the microscope, and found the six feet each armed with two sharp powerful claws, these gripped the skin like pins every time the insect alighted, and thus caused the intense restlessness and excitement in the mare.

As racehorses go to and from Noumea, men in charge should be very careful not to bring the pest-fly along with their horses. Owing to their delicate skins there seems to be little danger; however, they may easily be brought on a rough-coated horse, as proved by the above incident.

REFERENCE TO PLATE.

1. *Melophagus ovinus*, Linn.—Sheep Tick, drawn from a micro.-slide, showing details of structure.
2. *Melophagus ovinus*, Linn.—Foot, showing claw and process between, supposed to be used for holding on to wool.
3. *Hippobosca equina*, Linn.—The Forest Fly, infesting horses.
4. ,, ,, Foot, showing claws and feather-like process used to hold on to the hair.
5. *Olfersia Macleayi*, Leach.—The Wallaby Fly.
6. ,, ,, Foot, showing structure of claws.

Bees, and How to Manage Them.

ALBERT GALE.

The Mysteries of Drone-production.

ASSOCIATED with the word drone are the terms lazy, idle, and indolent, a ne'er-do-well, one who sponges on society, a human parasite. Sometimes it is used to indicate a low, dull, heavy, monotonous sound. In either case the character of the drone or male bee has given birth to the meaning of the word as now used.

In the latter case the sense attached to the word is very appropriate. In the spring time, those who live near beekeepers, even if they have no ear for music, cannot fail to be attracted by the low, heavy sound in the air that is so frequently heard about midday when the sun is shining brightly. As it regards the sound emitted by the male bee, the use of the word in that sense is quite justifiable. But as it regards the traits of the male bee being classed with society's drones, there is nothing whatever to justify the assumption, and there is nothing analogous or parallel between the drone bee and the idle and indolent of the human family.

The idea of bracketing everything lazy and idle with the male bee sprang from a want of knowledge in the early history of social bees. The drone was, and indeed is, by many even to-day, looked upon as an interloper—a thief and a robber. From appearance there is a good deal to vindicate this notion, because he differs, both in form and habits, so greatly from the working bee. He is about one-third larger than the worker, is more bulky, with an abdomen composed of seven 'segments instead of six, as in the worker; wings larger in proportion than the worker; has no pollen baskets, no wax pockets, and no sting. In habits he has never been seen working among the flowers; never seen returning home laden with the spoils of the field. Within the hive he has never been detected in any domestic duties whatsoever. At one time, all this went to point him out as a different variety of bee altogether from *apis mellifica*, if not a distinct species of insect.

Why should the male bee be so maligned? Why should he be a Cain amongst his brethren, everyone trying to slay him? Why should he be an Ishmael bee that every man's hand is against? Amongst other domesticated animals the males are regarded as of the first importance. Their owners are as proud, and in some cases even prouder (in some instances they should be) of the pedigree of their choice sires than they are of their own genealogical records. Sires always fetch a much higher figure in the market than dams. It is the same in the feathered race. A rooster is worth no more for the table, weight for weight, than a hen. In the yard he is not nearly so valuable. A hen will lay without him, and the eggs are equally good, if not more so, for table purposes. It is the same with other high-class domestic animals. If a man wishes to obtain a name for himself as a breeder of high-class animals, he spares no expense to obtain high-class sires. The dams are looked upon as secondary. Why? The sire is one with many, and the dam one with one. The type of the sire is gradually transmitted through the whole herd. Generations afterwards the throwbacks can be pointed out as carrying the typical form and traits of character of a favourite ancestor. Every care is bestowed upon the sires; it is they that are so advertised. In the show parades it is the sires that are the observed of all observers. When we come to bees the scene changes. We never hear the remark, Where is the drone? but, Which is the queen? If the sire amongst quadrupeds is one among many, transmitting all his good points among the many, how much more so is it the case with drones? With the quadruped every descendant is the result of one or more matings between two animals. With bees how different. It is one, and only one, meeting between two individuals, as will be seen by referring to my article on the queen bee in a former *Gazette*. But how different the result of that single mating. It produces hundreds of thousands of descendants. More remarkable still, the mating of drone and queen results in a progeny of *all* females. Do not mistake me. I know that queen bees produce a mixture of sexes. But the males are not the result of the mating with *her* consort, *i.e.*, the one that produced the progeny resulting in all females, but are the outcome of a previous generation, the said fecundation resulting in a male progeny only. How can I tell? A golden Italian queen (*a*) mismates—that is, she has come in contact with a black drone (an English bee). What is the result? All the females (workers and queens) are what we should expect them to be, cross-breds, usually termed hybrids; and if the queen is from a pure stock with Italian blood running in her veins for two or three generations back, the *males* she produces are all pure Italians without a taint of black blood visible or invisible. Again, a pure-bred English queen (*b*) with two or three generations of black blood in her veins mates with a full-blood Italian drone (*b*) resulting in a female progeny of cross-breds as with the queen (*a*), but the males are full-blood blacks. Now let a perfect and complete female bee (*a* 2), being an immediate and direct descendant from the queen (*a*), mate with another black drone. Of course, it will neither be drone (*a*) or drone (*b*), because that would be an impossibility; drone (*a*) and drone (*b*) having died immediately after mating, as is always the case. This was fully explained in my previous article on the queen bee. The result of the fecundation of the queen bee (*a* 2) is that all the female progeny have more black blood (three-fourths) in them than their mother; but the males have the same amount (one-half only). The female progeny from the queen (*a* 2) is the result of her mating with the second-named black drone—her consort; but the males are the result of the meeting between the first-named black drone and the queen (*a*). Again, let a perfect and complete female bee—a queen (*b* 2)—also being an immediate and direct descendant from the queen (*b*), mate with a full-blood Italian drone. The result of the contact is that all the female progeny have more Italian blood in them (three-fourths) than their mother; but the males—the drones—have the same amount (one-half only); so it goes on with every succeeding generation. The female progeny of every queen is the result of *her* fecundation; but her male progeny is the result of the queen's mother's fecundation. Is this a case of partial parthenogenesis—production without immediate fecundation; or is it a case of atavism—a throwback?

Here is another peculiar thing in connection with the mysteries of drone production. Queen bees are what are termed perfect and complete. They are perfect as it regards their form, and have their sexual organs fully developed—that is, procreatively receptive. Working bees are perfect and incomplete. They are perfect as it regards form; but their sexual organs are undeveloped—that is, they are procreatively non-receptive.

It is not an uncommon thing, from some as yet unknown cause, for a working bee to become procreative. They are usually termed fertile workers. These fertile workers assume all the functions of queens. The workers treat them as such, but I think always with a certain amount of misgiving. They lay eggs, but from these eggs drones are always developed. Is this power of laying the result of the copulation of the previous generation, or is it a case of parthenogenesis? If parthenogenesis, how is it that it so rarely shows itself? If a virgin queen, through some accident to her wings or any other cause, looses the power of flight, thus preventing her consorting with a mate, she becomes, in beekeepers' phraseology, a drone-layer. In this respect she stands exactly on the same plane with fertile workers. All unmated queens are always drone-layers; but drone-laying workers (fertile workers) are of rare occurrence. In the case of drone-laying queens, through the loss of the power of flight, she ceases to be procreatively receptive. A fertile worker has, and has always had, the power of flight, but, procreatively, she was never receptive. Yet a drone-laying queen and fertile worker stands exactly upon the same footing.

The mysteries of the bee-hive, what an interesting subject! The reason of all this is full of wisdom! In this it is seen no working bee has a brother of full blood. It may appear to be paradoxical. It may even appear to be absurd, seeing that the same mother produced both the males and females of the family; yet, as absurd as it may appear, it is true in fact. It may be asked what relationship exists between the mother bee and the drone she produces, seeing that the father of her own son was the consort of her own mother—a relationship that is not catalogued in the tables of consanguinity?

Thus, if the influence of the drone, both in traits of temperament and working energy (although the drone works not, the energy for such is transmitted by means of the life-germ), is it not of paramount importance that as much, if not more, care should be taken to produce drones of high physique and energetic will as is now being done in relation to queen-breeding? If the sire in the higher type of animals is of such vital importance, how is it that the drone bee is not viewed in the same light with beekeepers? A difficulty stands in the way: We have not the selecting and mating powers in relation with bees that we have over other animals. Nevertheless, we can do much towards the selection of sires among bees. With beekeepers it is well known that the queen's powers in the reproduction of working bees gradually subsides with age; and as her powers of worker production diminish her powers of producing drones increase until, finally, she ceases to be sufficiently profitable or even capable of continuing her female species. It is usual with beekeepers to supersede all queens after two seasons' laying. It is also known that the progeny of some queens are 50 per cent. more energetic than that of others. If one or more of these known energetic queens, after they cease to be profitable, owing to the non-production of working bees in sufficient quantities to keep up the numerical strength of the colony, are for stud purposes kept to breed drones, one of the difficulties of selecting is overcome. Further, if the keeping of the drone-laying queen be followed by systematically cutting out or otherwise destroying all young drones in other hives before they emerge from the cells, we shall go a long way in the controlling the selecting powers of mating our bees.

HARVESTING MILLET FOR HAY.

SEVERAL of the millets—notably Hungarian—make excellent hay if sufficient precaution be exercised in the harvesting. The crop should not be allowed to ripen, or even develop seed, but should be cut almost immediately after the blossoming period. Cured at that stage the hay is nutritious and can be fed to cattle and horses without the slightest fear of the ill-results that are reported to ensue when millet hay containing ripe or nearly ripe seeds is used.

As to the best process of curing, a writer in the *American Agriculturist* says:—" Because of greater succulence, most of the millets are more difficult to harvest than timothy, as they cure much more slowly. This is especially true with German or Japanese millets which attain a great size. Cut with a mower, as any other hay crop, choosing, if possible, a dry time. Allow the millet to wilt and partially cure; then put in small shocks and allow it to remain in the field until thoroughly dried out. If permitted to remain in the swath until thoroughly cured, much of the feeding value will be lost—the blades and stems become dry and woody, many of the leaves are lost, and the digestibility of the hay greatly decreased. If cured in partial shade, however, a very good hay results. Stack in a mow or barn, as any other hay crop."

Besides its value for hay-making, millet is an excellent green feed, producing abundantly, and, properly handled, yielding two or three cuts in even a dry season. For green fodder the crop is at its best just before the heading stage.

Manufacture of the Chilian Chicha Baya.[*]

I.—Historical.

THE *Chicha Baya* (Golden Chicha), or, as it is commonly called, the *Chicha*, is nothing but a white wine that, prior to any fermentation, has been subjected to a short boiling process.

The manufacture of this exclusively Chilian drink was first devised at the end of the eighteenth century by Peter del Villar, a merchant from Havana.

According to the celebrated Chilian writer, Señor Vicuña Mackenna, this discovery seems to be the only one that never did require patent rights to bring wealth to its originator, who, it is well known in Chile, left, on his death, an enormous fortune, entirely derived from that invention which has been the cause of so much laughter and sorrow to the good citizens of that happy land—principal consumers of the popular chicha.

When that famous chicha-maker died, in order no doubt to clear up his conscience, he directed in his will that all his vineyards and wealth should pass to the Santiago Hospitals.

It is quite possible that a demand for this much abused beverage may never arise in this part of the world. The exhaustive account of the manufacture of it, hereunder given, contains so much information of general interest and value to all engaged in the production of wine, that it is felt New South Wales vignerons will appreciate the opportunity of noting the successful application in a latitude not so far removed from our own of scientific principles that govern many difficult problems in fermentation and other processes in wine-making.

II.—Grapes used for Chicha.

All kinds of grapes may serve equally well for the manufacture of this beverage, but the following are the most generally used in the country for this purpose:—

White Grapes—

Chasselas.
Folle Blanche.
Torrontese.
Muscats.
Blanquettes.
White Semillion.
White Gamet, &c.

Black Grapes—

Ordinary Black (native).
Black Muscat.
Black Pinot.
Black Gamet.
Côte Rouge.
Roman or Cæsar's.
Tressat, &c.

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[*] Translated and abridged from the "Bulletin of the National Society of Agriculture, Chile," by J.J.T.

The distinctive characteristics of each of these species are briefly enumerated hereunder :—

A.—White Grapes.

Chasselas.—The most common of this kind is the Golden Chasselas; its bunches are of medium size, sometimes a little above it, winged, loose or tight berried; long stalk of average strength; round berries, medium or large, according to class of soil where grown; fine, strong skin, varying in colour with the stage of ripeness; fruit juicy, slightly perfumed, and pleasing to the taste; matures early. The chicha it produces is of first quality, though poor in sugar. This vine is very plentiful in Chile.

Folle Blanche.—This well-known French species is distinguished by its large or medium bunches, according to richness of soil, tight berried, suspended from short, strong stalks, round berries of average or large size, thin skin of a golden yellow when ripe, soft, juicy pulp, somewhat tasteless. It matures rather late, and is plentiful in the country. This is the grape that produces the widely-reputed cognac of Charantes, France. The brandy obtained from it in Chile is also fairly good, according to experts. The chicha extracted from this grape is good, too, if properly worked; but the great advantage enjoyed by this species is that when its chicha cannot be sold it can always be turned into cognac by distillation.

Torrontese.—This vine gives large, cylindric, tight-grained bunches, with big, round, close berries, thick-skinned, golden-coloured in the warm districts and where carefully cultivated. When quite ripe these grapes are very fragrant and sweet; they are considered by many as the best white grapes for table use. The vines are very prolific and very abundant in Chile, specially in the central section of the Republic. It is a pity that this grape matures very late, as it makes one of the best chichas, if not *the* best.

Muscat.—The Muscats found in Chile are the *Common White* and the *Alexandria.* This last goes in Vallenar district by the name of "Huasco grape," and produces the famous raisins of that denomination. It also makes the "Armidita wine" of Huasco Alto, a fine liqueur which obtained the highest prizes in the Exhibitions of Santiago, Montevideo, Barcelona, and Paris. These grapes afford an excellent must for chicha, very sweet and pleasant, with a fragrant aroma quite peculiar to the species.

Blanquette.—The bunches of this vine are of medium size, cylindro-conical in shape, close berried, held by a long stalk of fair strength; small berries; fine skin; pulp rather juicy, sugary, and with a very pleasant perfume. It is late in maturing and somewhat scarce in Chile.

White Pinot.—We have in Chile the "Chardonay White" and the real "White Pinot"; both varieties are indiscriminately mixed specially in the fine old vineyards which can justly be called gardens by the wealth of their leafy display. First-class chicha is made with the Pinot grape; it has also a fair bouquet, and the species is an early maturing one.

White Semillion.—Is a vine giving fair-sized bunches, cylindro-conical in shape, with berries of medium bulk or rather large thick skin, which turns a fine golden yellow when ripe. This plant is very common in Chile, and it makes chicha of excellent quality. In Santiago large quantities of chicha made with White Semillion grapes are consumed.

White Gamet.—The fruit of this vine is good for nothing else but making chicha. Wine made from it, even when grown in the most favourable conditions, is never worth drinking. The chicha it produces, however, is fairly good, especially if mixed with another extracted from Muscat or Torrontese grapes.

B.—Black Grapes.

Ordinary Black.—This grape is known in Chile by the name of *Common* or *Native Grape (uva del pais)*. It has big, loose, branchy bunches, suspended from a rather strong stalk; its berries are round, medium or small, thick coated, sweet-meated, and fairly flavoured. It matures late. This plant is the most abundant in Chile, and is the one that serves generally for the wholesale manufacture of chicha.

Black Muscat.—Is one of the most acceptable table grapes grown, of small or medium-sized bunches, cylindric in shape, close berried, somewhat winged, with sweet, aromatic berries. Its chicha is of first quality. Matures early, and is plentiful in Chile.

Black Pinot.—A large proportion of the Pinot grapes grown in the vineyards neighbouring the cities of Santiago, Aconcagua, &c., is, some time since, specially used for the manufacture of *boiled* chicha. We think wine-growers are quite sensible to follow this practice, as the wine that is made with the Pinot is thin and poor—properties that make it very difficult to sell; indeed, the trade considers it as a very inferior, thin wine, and only well-established growers succeed in selling any made from this grape. It has, however, one point in its favour—in so far, at least, as its transformation into chicha is concerned—and that is its early maturity, which enables growers to use it for the production of the first chichas of the season. The Pinot grape has small, tightly-berried bunches of small round berries, with thick cuticle of a dull black colour, slightly powdery, juicy, very sweet meat. It is found in most of the French vineyards of the country.

Black Gamet.—Is a plant producing medium-sized grapes, fairly close berried; short, ligneous stalk; grains medium, elongated; skin fine and strong; pulp soft, juicy, and sweetish, with no particular flavour of any kind. It matures early, and what has been said of the White Gamet can equally well be applied to the Black species under consideration. It is often found in Chile.

Côte Rouge.—This is a plant with large, tight-berried, conical bunches of grapes; of round, big, juicy berries; black violet coloured skin; sweet and pleasant juice. It makes a good chicha, which, if properly worked, finds a ready market. It is very common in the Republic.

Roman, or Cæsar's.—This species is distinguished by its medium size, cylindro-conical, somewhat pressed shape of grapes; berries spheric, medium; skin thick, strong; black powdery tint when ripe; meat juicy, sweet and pleasant to the palate, no particular flavour. It makes excellent chicha, and is seen in a good many Chilian vineyards.

Tressot.—A vine producing rather large grape bunches, shaped as the above; close grained, medium, globular berries; juicy, sweetish, somewhat astringent meat; skin rather thin, but strong, black violet colour. It can be found in some vineyards.

III.—Manufacture of the Chicha.

General Remarks.—According to the definition of the chicha with which we opened this paper, this beverage can be considered practically as a white wine, and, therefore, the grapes to be used in its manufacture should fulfil all the conditions required for the production of a good ordinary wine.

Expert wine-growers know that to obtain a properly-balanced must, and therefore a good wine, the grapes should be gathered precisely at the time they have attained maturity—that is, when they have acquired the proper degree of acidity and sugar necessary.

The operation of vintage is on this account more complicated than what it might appear at first sight, and the wine-grower, or his colleague the chicha-grower, should make himself perfectly sure on this important point before starting operations.

The quantity of sugar a must ought to contain to produce a wine or chicha that will keep well must never be lower than 10 degrees, as measured by Baumé's saccharometer. With regard to the acidity, referred to sulphuric acid, it should be between 6 and 9 grammes per litre.* These proportions ensure a good equilibrium of all the constituents of a wine that will keep and find a ready sale in Chile.

Some of the grapes that serve for making chicha in that country are reserved for this purpose solely because they are so poor in sugar that they are useless for the production of wine. Such is the case with the grapes of the native species—the Chasselas, &c.—which hardly ever can show beyond 7 or 8 degrees Baumé.

Care should be taken by the chicha maker in such instances to follow Nature's law, as recommended by agricultural science, and to manufacture his chichas as per directions given in another part of this paper.

We have referred the quantity of acids required to make a good wine or chicha to the sulphuric acid; if it should be desired to express this quantity as tartaric acid, it would suffice to multiply the average acidity, as expressed in sulphuric acid, by 1·53 which is the equivalent in tartaric acid for one gramme of sulphuric acid.

The important action exerted by the acids in a wine or chicha is forcibly shown in the following words of Pollacci: "Withdraw the acid from a must and the vinous fermentation either will not appear at all, or will degenerate with a rapidity truly wonderful; withdraw the acid from the wine, and the result will be an abominable drink which will not keep nor mature, and that if it grows older it will fail to develop any of the bouquets characteristic of the wine."

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* 1 gramme = 15·43 grains; 1 litre = 1·76 pints.

Vintage.—When grapes have attained the proper degree of ripeness—that is, when the must shows the exact proportions of sugar and acidity necessary to the production of good chicha—vintage operations commence. In Chile the gathering of the crop is performed by gangs of men, women, and children, carrying baskets, boxes, &c., all under the direction of a foreman or master of vintage operations. Workers are classed, according to the special kind of job they are allotted, into cutters, carriers, carters, &c. Cutters are provided each with a knife or pair of scissors, and distributed in lines of two deep ; their duty is to cut and place the bunches in baskets or boxes of a convenient shape and size which permits a ready inspection of their contents and condition. When these baskets are filled up with grapes the carriers take them up and empty contents into larger vessels, which in their turn are carted up when full and taken away from the field by the men in charge.

In some vineyards the same boxes on which have been placed the freshly gathered grapes serve to take the crop away to the winery, but this objectionable practice is the cause of considerable loss of must, and contributes also to soil the grapes and baskets very much.

The carter's duty is to load and accommodate in their respective vehicles the vessels containing the crop, and to carry this away to the winery to be crushed.

The master of vintage operations, or the grower himself, should see to the proper execution of all field work above described, rigorously forbidding the cartage of any green, rotten, or otherwise deteriorated grapes likely to damage the quality of the future chicha.

Gathering baskets, boxes, and other collecting vessels for field use ought to be of such a size as to weigh from 30 to 50 kilos* when full. Thirty kilos is the measurement for baskets, which can thus be easily manipulated by one man ; while 50 kilos should be the average weight of the larger vessels, whose manipulation requires two men.

A gang of vintage operators can be formed with—

1 foreman
20 cutters
2 loaders
2 or more carters.

The number of these last employed varies in accordance with the distance between the vineyard and the winery, and the number of the rest alters likewise in harmony with the skill of the people employed and that of the foreman, who, at all events, must be thoroughly up to his duties if he expects to be properly obeyed.

Vintage operations are carried under more serious difficulties than usual when, with the object of having chichas ready for the early market, the crop has to be gathered only partially at a time.

There are vineyards where this operation is gone through three times over, gathering only ripe grapes at a time—that is, grapes which previous experience leads to suppose have acquired the highest degree of acidity and sugar they can naturally attain.

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* 1 killogramme equals 2·21 lb. Avoird.

If different species of vines happen to grow, indiscriminately mixed in one vineyard, as sometimes is the case in old Chilian properties, gathering is commenced with the grapes of early maturity, as Chasselas, continued with those following after, as Pinot, and finished with the native species, the Torrontese, &c. These operations are, of course, made easier if every class of vines cultivated has its own section in the yard, as is the case in all the younger vineyards of the country.

Vintage in the circumstances explained above is generally a very expensive affair, but wine growers following such practice more than recoup themselves of the extra expense by the enhanced prices they can always command for their produce.

We have stated before that only the best grapes should find their way to the winery. This is made a rule in every well-managed vineyard in Chile, where all green, damaged, or rotten grapes are gathered apart. This deteriorated stuff can always be used for the manufacture of spirit.

The men employed should be recommended to observe the greatest care in keeping all baskets and utensils scrupulously clean, to avoid filling them up with bad grapes, leaves, lumps of earth or any such objectionable matters, and women should be engaged if necessary to cut off all green or bad berries that may be seen in the bunches. Robinet says: "This extra work is but a mere trifle that is more than compensated with the profit derived from it."

The point of cleanliness in the utensils used, which we have recommended, is sorely neglected in Chile; in most cases these utensils are washed only once a year, immediately before the vintage, —a slovenly practice, which deserves the strongest condemnation, as it encourages the formation of undesirable ferments that may well act injuriously in the vinous fermentation that is to come, and so completely spoil the quality of the product.

To prevent and destroy the development of such objectionable ferments, all baskets, casks, kegs, &c., used should be washed daily, or at least every other day after the day's work. "All vintage operations require—says the above quoted writer—the most scrupulous cleanliness if it is wished that success may be the result."

Crushing.—This work is done by machinery or by hand, on wooden or more elaborate contrivances which allow the expressed must to fall direct into the boilers, where the subsequent operation takes place. This arrangement is no doubt the best, and it saves much time and expense.

The grapes thus crushed let the juice expressed during the process to run off, leaving behind the marc, which is immediately taken to a press to be further exhausted. Now, if the object is to make ordinary chicha, this second juice is added to the first one in the boilers; but if prime chicha is the object, only the first naturally drained juice is used. When the grapes operated upon are white grapes, the mixture of these two juices gives always a first-rate chicha, but press juice extracted from black grapes may come from the press coloured already if the operation is not done quick enough. In any case—be the grapes black or white—it is of the utmost consequence to act quickly, so as to prevent the initiation of fermentation, which would exert a most injurious influence on the quality of the resulting chicha.

Boiling of the Must.—Boiling can be done in three different ways,—by steam, by means of bain-marie, and by bare fire applied direct to boiler. Each of these ways has its advantages as well as its objections. In boiling by means of steam or the bain-marie there is no risk of burning the must and imparting an abnormal, nasty taste to the chicha. Boiling in the ordinary way, or with common boilers, certainly saves expense; but there is great risk of burning the chicha, despite all care or skill exerted by the man attending the operation. This last method is however the one generally adopted all over the country, and our remarks will bear on it specially.

The boiler is filled with must up to within 15 to 20 centimetres* from its top; this space is left vacant to prevent overflowing of the fluid while boiling. The furnace underneath is then lighted, and fed at regular intervals with firewood, trying to increase the heat as uniformly as possible; the temperature of the boiling liquid will be kept constant by avoiding any sudden increase or reduction of heat in the furnace which might cause burning of the chicha.

Prior to the stage of ebullition the liquid becomes agitated and brings up to its surface a quantity of froth—white first, black afterwards,—and accompanied with pips and grape pulp that may have escaped with the expressed juice. This is the critical moment for the man in charge of the operation; immediately this phenomenon is observed he should skim off all froth as it forms, and have it done before the liquid actually starts boiling. The slightest neglect or oversight at this stage is sure to cause the liquid to swallow its froth and thus turn out a bad chicha, prone to ferment as soon as it cools down sufficiently.

Whilst the must boils it continues to give up froth, though in smaller quantity than before, and the attendant should remove this also as it forms until the operation is quite finished.

To determine the closing stage of the operation, some chicha manufacturers in Chile follow arbitrary rules which have no rational foundation whatever. Some consider, for instance, that when the liquid has diminished by about one-fourth of its original volume during this boiling process, the operation should be brought to an end, but obviously enough this rule cannot be applied to all kinds of boilers in use; thus a boiler with a large surface would turn out a chicha far more concentrated than another of proper height but of smaller diameter. As in this way no chichas of anything like uniform quality could possibly be obtained, we shall give some directions to correct the defect,—the result of a long and successful experience extending over a period of many years.

The point to be at once determined is that when we should consider the chicha sufficiently boiled. According to our experience, this point is reached when the liquid, tested by the Guyot or Baumé saccharometers, shows an increase of 2° of sugar, ; so, if its original sweetness was, say, 10°, the chicha should mark 12° at the end of the boiling process. If this increase is less than 2°, the chicha has not been sufficiently boiled and therefore it will be thin and raw tasting. This is a fact well known to chicha merchants, specially by those who are in the habit of mixing this liquid with poor wines. On the other hand, if the above increase exceeds 2°, the chicha will probably turn out burnt—a contingency unfortunately too frequent with the ordinary boilers; but even if burning is prevented, the liquid will surely acquire a more or less abnormal taste, dependent upon the degree of its concentration. Chichas of this kind are consumed mixed with others insufficiently boiled.

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* 1 centimetre=0·39 inches.

The saccharine richness of the chicha can only be gauged by the saccharometer, but this operation is naturally a very difficult one in the circumstances under consideration; in the first place, as the liquid is at boiling point, there is great risk of breaking the instrument, particularly if made of glass, and in the second place, measurements taken at this stage are never correct, as the instruments are graduated to a temperature of 15° C. The readings of the instrument at a higher temperature are more or less inaccurate, and this makes certain corrections necessary; to one not used to it this rather troublesome. On the other hand, the liquid cannot be let to cool down to the prescribed temperature, or the whole operation can be spoiled.

We have obviated these difficulties in the following way:—The must is put to boil in the usual way, and one hour and a half after the commencement of ebullition, it is promptly withdrawn from the boiler and emptied into a cooler ready for the purpose. The chicha in this case, when leaving the boiler, marks 1½° more of sugar than originally; the other ½° required is gained by the evaporation the liquid undergoes while cooling down.

Before closing this subject, reference should be made here to the practice adopted by some chicha makers of throwing a handful of well-sifted vine-cane ashes on to the must just when boiling starts; the quantity used is one handful of ashes for every 500 litres more or less of liquid.*

Followers of this practice divide themselves into three sections. One asserts that the must gets rid of the froth much easier by the addition of these ashes, and that, therefore, the chicha results clearer; the second affirms that cane ashes applied in proper time prevent the liquid from swelling while boiling; and the rest opinionates that ashes help the chicha to turn out less acid.

Let us now study this question under its three different points of view just explained: With regard to the first theory, we may say that we have manufactured chicha, both with and without the addition of cane ashes, and in every instance we have produced a good, clear chicha. In answer to the second theory we do not know what properties ashes may possess to arrest the must from expanding and

* 100 litres = 22 gallons.

overflowing while in ebullition. No doubt this must be a fact wrongly observed, and our belief is that the intensity of the agitation imparted to the boiling liquid is dependent upon the manner in which this operation is usually performed: hence why we recommend the gradual increase of the heat applied thereto.

Let us now consider the last school of theorisers: It is a fact that grape-must contains carbonic, tannic, tartaric, malic, citric, and other acids; the most important of all being the tartaric acid, which is found in must in the state of glucose-tartaric, whose sugar disappears little by little, leaving the acid free. Most of this substance is met with in fermented chicha in the state of cream of tartar (bitartrate of potash), resulting from its combination with potash.

In vine-cane ashes, according to Houzeau (*Boussingault, Economie Rurale*), there are 20·1 per cent. potash and 30·5 per cent. lime. Now, is it that lime and potash in this case do combine with the acids of the must? If so the following salts would be formed:—

Bitartate of potash, which is slightly soluble in water.

Tartrate of lime, an insoluble salt in water, which is eliminated by racking.

Malate and tartrate of potash, soluble and perfectly harmless salts.

As to *carbonic acid*, it escapes with the boiling.

The soluble salts, such as the malate and tartrate of potash, are very difficult to eliminate from the must.

If the above combinations should really take place, the froth would bring up to the surface of the boiling must all the more or less insoluble salts like the bitartrate of potash and tartrate of lime, which the skimmer would then take away along with the froth.

Cooling down of the Chicha.—It has been mentioned elsewhere that after boiling, the must is emptied into special vessels where it is left to cool. These cooling utensils are made of cement, wood, or chalk: those of cement, however, answer best this purpose, as they are easy to clean and allow a rapid cooling of the must. The wooden vessels are objectionable because they always retain in the pores, despite the most thorough washings, traces of the liquid they have contained, and thus hold in store yeasts prejudicial to the fermentation that the chicha has to undergo; wood also acquires in time a nasty smell, which is easily transmitted to the liquid. Cooling apparatuses are similarly objectionable when made of chalk, for the hardness with which they wash, and their property of bad conductors of heat which allows the chicha to cool down in them very slowly. These last two kinds of coolers are also made generally too high to be conveniently handled.

Cement coolers should have a height of from 50 to 60 centimetres, and the necessary length and width to make up any required volume.

To determine the dimensions, and therefore the capacity desired for a cooler, we must first know what quantity of freshly-boiled chicha can be conveniently put down to cool at a time, remembering that on no account should a chicha freshly drawn from the boiler be emptied on top of another that has become cold already.

A man can easily attend to two boilers of a capacity of 500 litres each, and perform two boiling operations during the journey—one in the morning and the other in the afternoon.

The morning and afternoon boilings can be emptied into a cooler of 2,000 litres, or 2 cubic metres of capacity, whose dimensions could be:—

Height, 0·6 metres; length, 2·5 metres; width, 1·30 metres.

A cooler with these measurements could take in 1,950 litres, serving to cool down all the liquid withdrawn from four boilers of the capacity above stated, and to have still a free space of 10 centimetres on top, which is usual to leave there.

The bottom of a cement cooler must be perfectly horizontal and smooth. In one of the sides, and about 5 centimetres from the bottom, an outlet is provided which allows the withdrawal of chicha from the cooler without much disturbance to the mass; this height of 5 centimetres prevents the withdrawal of the lower layers of the liquid, which being always turbid, gives ordinary chicas only, or a liquid fit for the still. To save extra work and expense the cooling vessels are fixed in the vicinity of the boilers, and are made to rest on the floor, well protected against vibrations or movements that might induce the chichas to start fermenting. When the coolers have been filled up they should be left perfectly undisturbed until the chicha becomes quite cold; this liquid is then taken from the coolers either for immediate sale or for the fermenting vats.

Fermentation of the Chicha.—In vineyards situated in the neighbourhood of large cities, such as Santiago and Valpariso, &c., the chicha, as a rule, is sold immediately it is made—that is, recently cooled and still in its sweet condition; in these circumstances it commands a higher value, and is largely used by retail merchants for the *coupage* with fermented chichas, which generally can be obtained at lower prices. Growers placed in such advantageous circumstances rarely ferment their chichas unless compelled to it through slackness of demand. When it is desired to obtain fermented chichas without delay, the cooled liquid is taken to large vats of from 2,000 to 3,000 litres capacity; but if chichas that will keep more or less sweet for some time are wanted, only small casks of about 10 arrobas* each, previously sulphured and fixed in a cool fermenting house, are used; in either case the liquid to be fermented requires the same treatment as a white wine. While the first or tumultuous fermentation is in progress the fermenting vats are kept wide open, the lids being put on when the slow fermentation is initiated. One month or more after this operation, when fermentation is no longer perceptible, the lids are tightened down, wrapping them round first with some porous material to make them fit tighter. The first racking of the chicha wine takes place in June or July, and the second is proceeded with in August if the chicha has not been disposed of in the interval. If necessary, at the time of this second racking, the chicha is fined.

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1 arroba = 35·55 litres.

IV.—Manufacture of Special Chichas.

The chicha baya is classified according to the species of grapes used, or the manner in which it has been made, into ordinary chicha, prime or special, muscatel, filtered, unfermented, champagne, concentrated chicha, &c., &c.

We will offer some brief remarks upon each of these different classes of chicha.

Ordinary Chicha is that made with native grapes, or any other grapes lacking any particular flavour, such as the Pinot, Roman, Tressot, &c.; for this chicha no separation, either on the coolers or casks, is required.

Prime or Special Chicha is obtained from any kind of grapes, taking care to withdraw separately from the coolers or storage casks, by means of openings conveniently made at different heights on the sides of such vessels, the clearer and troubled layers of the liquid. The clearer portions thus withdrawn, when the grapes used are aromatic, are classified as special chichas, and the portions of turbid liquid are sold as ordinary chicha. Sometimes these two kinds of liquid are mixed up together again, and sold as ordinary or prime chicha, according to the resulting dominant quality.

Muscatel Chicha.—This is made from white or black Muscats, and Torrontese grapes, and is the sort of chicha in greatest request and of highest value. In the trade these chichas are known by the name of Muscatels. They are divided into fine or special—that is, properly separated,—and ordinary if made in the usual way.

Filtered Chicha.—Chicha in its natural state holds a large quantity of substances in suspension and dissolved, which subside gradually on to the bottom of the casks as fermentation dies away. An alcoholic liquid whose transparancy is impaired in this manner is unpleasant to the eye and nasty to the taste; filtering modifies both defects, and permits the production of an attractive and clean beverage. The custom in the country is to filter only the unfermented and champagne classes of chicha, and the methods adopted therefor are exactly the same as for filtering wine, be it in a large or in a small scale.

Unfermented Chicha.—Some time since the sale of chicha in tin vessels has been introduced in Chile, the liquid thus sold going by the name of unfermented chicha. This chicha is bottled up in tin vessels of from 2 to 20 litres capacity, while it is still quite hot from the boilers; the size of these tins most in use is of about 5 litres. To carry out successfully this bottling-up operation, a pipe or tube is adjusted to the tap at the bottom of the boiler, through which the chicha is allowed to run straight on to the tins, these are so filled up to within 2 centimetres of their full capacity, and a tinsmith then covers and solders them properly, the tins are immediately after taken to a cool cellar, where they are kept until sold.

Only good tins, perfectly staunch, should be used, and the whole operation gone through rapidly if satisfactory results are desired.

Some chicha makers filters the liquid prior to its bottling up in these tins, but if such filtering is desired, the liquid should not be allowed to cool during the process, or otherwise it will be necessary to take the tins afterwards to special pasteurisers.

Keeping Chicha is the class of chicha made by a process that ensures its keeping sweet for a longer or shorter lapse of time. This process is a very delicate one, and the slightest oversight may bring with it the loss of a considerable quantity of chicha, and therefore of money. The practice consists in thoroughly washing first all vessels required for use, and whose capacity may be of 5, 10, 15, 20, and 30 arrobas each*; larger ones to be objected to for this purpose. These vessels are then taken to a cellar, as cold as it possibly can be had, and placed there on solid rests to avoid all vibrations; the floor of the cellar is so made as to permit the recovery of any liquid that may overflow from the casks. These are ranged wide apart from one another, so as to facilitate the withdrawal or emptying away of any one of them without interfering with the others.

All these points having been duly attended to, the chicha is brought over quite hot and direct from the boilers to the casks by means of pipes which prevent any exposure of the liquid to the air. Immediately a cask is full, its head is placed on and cemented in order to make it perfectly airtight. No further manipulations are necessary.

Chicha can in this way be kept sweet till September or October—that is, till the end of the chicha season. This class of chicha generally fetches high prices, sometimes 6 dollars and 7 dollars having been paid for it in September, when other chichas of immediate sale are obtaining, perhaps, no more than 4 dollars† per arroba.

Champagne Chicha.—Is also called "sparkling," and is made by bottling up the liquid when it contains 20 grammes of sugar to the litre—that is, 16 grammes to the bottle of 800 grammes—usual size of Champagne bottles. This saccharine percentage corresponds to a little over 0·5° of the Baumé scale at the temperature of 15° C. Champagne chicha can be bottled in its natural condition, or filtered; in the latter case it is very pleasant, and of higher value.

Concentrated Chicha.—Also called "cocido" (broth), by old identities, is made by boiling the must until it marks 16, 18, or 20 degrees of sugar. There is great risk of burning if this chicha is heated by bare fire; but no such contingency is to be feared if the boiling is done by means of steam or bain-marie, which always gives a chicha of first quality. Concentrated chicha is used to sweeten strong chichas, and is also drank if suitably diluted in water. This liquid saves much freight, and can be transported long distances without fermenting, provided it is placed in well-sulphured casks.

Fortified Chicha.—To get a fortified chicha, it is first concentrated as above, until a liquid of from 18° to 20° of sugar is obtained; then a 15 per cent. of alcohol of 40°. Cartier is added to it, and the product stored in casks in a cool cellar. When it is sold, it is racked into well-sulphured kegs, and carted away. These chichas, killed by alcohol, are generally mixed with poor wines or with strong chichas, in the proportion of 1 to 10—that is, 1 arroba of fortified chicha for every 10 arrobas of strong (fermented) chicha or poor wine. Four to eight days after this *coupage*, the liquor enters into fermentation, and is then sold to the public.

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* 1 arroba = 35·55 litres.

† One Chilian dollar = 1s. 6d.

There are large establishments in the south of Chile where chicha is sold in this manner.

V.—The Chicha Trade in Chile.

Our remarks under this heading will be confined to the business between manufacturer and chicha merchant. It has been shown that chichas are sold sweet, strong,—that is, already fermented,—and half fermented, or between strong and sweet. Chicha, in its sweet state, is sold immediately it is made, or otherwise is made as "keeping chica," and stored.

The vessels in which the chicha is sold by makers are of 5, 10, and 20 arrobas each for big deliveries; or kegs of 1, 1½, and 2 arrobas are used for small orders. It sometimes happens, however, that large buyers stipulate to be served with small kegs, which they in their turn require for retail business. Wine or chicha growers must, in consequence, be well provided with vessels of all sizes to meet the requirements of their customers.

Before using a keg or cask, it should be thoroughly washed with potash or soda in the proportion of 1 lb. of these substances to every 10 litres of boiling water, and after a good rinsing with clear water wiped dry; the chicha can then be safely transferred to such vessel. Casks in which the chicha is stored for some time ought to be sulphured, but not so, if the chicha is for immediate sale as in this case the smell of sulphur could not be eliminated in the short space of time available and the quality and value of the liquid would alike suffer. Sweet chicha should not be carried away any distance until quite cold; if still hot or tepid, the slightest trepidation may induce fermentation; there are instances in which a chicha transported when still hot started fermenting six days before another and older made one that had been taken away according to orthodox rules.

The chicha that swallows its own froth when boiling ferments very soon.

Chichas on being delivered to buyers are emptied into suitable recipients open on the top, or with top head removed, and of a capacity varying from 5 to 30 arrobas.

Every merchant in chicha, both wholesale and retail, makes a rule to keep each different kind of chicha in its own separate cask, to suit the tastes of his customers.

Staggers in Sheep.

PROGRESS REPORT ON INVESTIGATIONS CARRIED OUT AT NARRABRI.

J. D. STEWART, M.R.C.V.S.

On the 1st May last I had the honor of submitting an interim report on an investigation carried out at Narrabri in connection with the disease known as "staggers in sheep." The report dealt specially with the history of the outbreak, the symptoms and *post-mortem* appearances of affected sheep. The disease condition was regarded as one of temporary prostration, the exact cause of which could not at that time, owing to its peculiar nature, be definitely diagnosed. It was, however, suggested that it might be due to one of the following causes:—

a. To a micro-organism.
b. To microscopic degeneration of some organ.
c. To deficiency of some of the ingredients of food essential for the building up of healthy tissues.
d. To the effect of some toxic property of the marsh-mallow.

With a view to ascertain which, if any, of these causes was operative in this disease, a number of specimens were collected for bacteriological, pathological, and chemical examination, as it was recognised that the cause could only be discovered by means of delicate tests and microscopic observation.

The bacteriological and pathological examination was carried out by Dr. Millard in the absence of Dr. Tidswell, of the Department of Public Health, while the chemical analysis was made by Mr. Guthrie, Chemist to the Department of Agriculture.

Reports as to the results of these examinations have been duly received, and are reproduced herewith.

The examination of the blood, tissues, and organs of affected sheep gave no indication as to the cause of death. The analysis of the leaves of the marsh-mallow, which constituted the main sustenance of the sheep at that time, showed no deficiency of nutrients, but an excess of nitrogenous material, the nutrient ratio being about 1 to 1¼. This result, when compared with what is considered the best nitrogenous ratio, *i.e.*, 1 to 3 or 5, seems to be of sufficient significance to be regarded as positive evidence, for it is recognised that disturbance of the equilibrium of nutritive proportion of food is invariably followed by diseased conditions. The following occurrence, however, somewhat militates against this conclusion:—On the 21st August last, Mr. Inspector of Stock Farrand reported a disease affecting a mob of travelling bullocks passing through Narrabri from Queensland, which, from the symptoms presented, and *post-mortem* appearances observed, he regarded as being similar to that known as "staggers in sheep." Sixty out of 224 bullocks became sick; many of them lost power of the muscles of the hind legs, and showed evidence of shivering.

Unfortunately I had no opportunity of examining these bullocks, and consequently cannot make any definite statement concerning them. Should the disease which affected these bullocks be identical with that known as "staggers in sheep," the view that the cause is traceable solely to the ingestion of marsh-mallow does not appear so tenable, since at the time the bullocks became affected trefoil constituted their principal sustenance. Still the ultimate effects might possibly be similar, as trefoil is rich in nitrogen.

There also exists a disease affecting horses, known as "Shivers," the cause of which is commonly ascribed to the "Stachys arvensis" or "balm-weed." This disease resembles in many features that known as "Shivers" in sheep, especially in that symptoms only become manifest on exertion.

"Shivers" in horses was investigated in 1894 by Mr. E. Stanley, F.R.C.V.S., who is of the opinion that the disease is malarial in origin. Although the presence of a micro-organism has not been demonstrated in the blood of affected animals, the fact that the disease appears to be more prevalent in low-lying localities in the vicinity of rivers, and consequently liable to be flooded, is in itself significant. It is highly probable that the diseases known as "Shivers" as affecting horses, cattle, and sheep, although at the present time attributed to different and various causes, are identical and due to a common cause.

So far as the present investigation has been conducted, the cause of the disease must still be regarded as obscure, for the results of the various examinations do not appear sufficiently definite to enable one to formulate a decided opinion.

It is proposed to further prosecute the investigation when recurrence of the disease affords the necessary opportunity.

Report of Dr. Millard, Assistant Medical Officer of the Government.

In the absence of Dr. Tidswell I have examined microscopically specimens forwarded by Mr. Stewart, of tissues of sheep affected by "staggers."

Specimens from two cases were sent and included:—

Case 1. Cerebrum motor area.
Spinal cord lumbar, dorsal.
Cardiac muscle.
Lung.
Spleen.
Coverslip smears from spleen and blood.

Case 2. Cerebrum motor area.
Cardiac muscle.
Leg muscle.
Spleen.
Liver.
Coverslip smears from heart, heart's blood, kidney.

The cerebrum, spinal cord, cardiac muscle, leg muscle, and liver showed no pathological changes.

Lung sections (Case 1) showed general engorgement of the air-cells with red blood-corpuscles. There were no evidences of inflammation, and the blood had possibly been sucked into the air-cells by an inspiration during the cutting of the animal's throat.

Spleen from both cases, but especially from Case 1, showed marked increase of leucocytes in and around the Malpighian follicles, but no signs of splenitis.

Blood smear, Case 1, showed a few short, thick bacilli, probably of no pathological significance.

Other smears—examination gave negative results.

Report of Mr. F. B. Guthrie, Chemist to Department of Agriculture.

In connection with the attached report, I have made an examination of the fresh leaves of the plant known as marsh-mallow, forwarded by Mr. Stewart, with the object of ascertaining if it was deficient in nutritive ingredients.

The analysis is as follows :—

Analysis of Fresh leaves of Marsh-mallow.

Water at 100° C.	=	78·40
Ether-extract (oil, chlorophyll sq.)	=	0·57
Fibre	=	3·13
Proteids (N × 6·25)	=	6·06
Carbohydrates	=	7·14
Ash	=	4·70
		100·0

The above analysis shows no deficiency of nutrients, but excessive nitrogenous material, the nutrient ratio being about 1 to 1¼.

It is very probable that this excessive proportion of nitrogenous matter may be at the root of the trouble. Excessive proteid consumption is known to be injurious in the case of human beings, and to lead to all sorts of obscure complaints. On the other hand, there may be an alkaloid or a poisonous proteid substance present, which has produced the toxic effect. I have not examined for such substances. If it is thought desirable to do so I must ask for a further supply of fresh material.

Still again, the disease may be due to some cause quite distinct from the nature of the food. Whether or not it is desirable to carry the chemical investigation any further will depend upon the result of the bacteriological and histological examinations, which I understand are being conducted.

Report on an Inquiry made in April, 1900, as to the nature of the Disease known as "Staggers" in Sheep.

The character of the country where the disease is prevalent is that of alluvial flats and plains of rich soil, extending back from the Namoi River, between Narrabri and Wee Waa, to a distance of about 8 miles.

During the past three years the Narrabri district has experienced a series of severe droughts. As a result the land in many places is quite bare, while in others it is covered with a short, patchy growth of herbage. There has been little or no grass in the district for some time past, the chief sustenance of the stock being herbage. The herbage comprises marsh-mallow, trefoil, turbine, wild melon, &c. During last November a fall of rain occurred, which brought about a rapid growth of herbage. This luxuriant growth passed off during the following dry months, and the sheep have since lived on a recent shoot of herbage (mostly marsh-mallow), and the seeds of the trefoil and other herbs, which they pick up off the ground. Notwithstanding this limited supply of food, the sheep keep in fair condition, and many become sufficiently fat, to warrant their being sent to market. The sheep are mainly of the Merino and Lincoln breeds, or are cross-bred.

The disease has been noticed on this district for some time. During the past two years it has been more and more prevalent, until at the present time it may be said to be fairly common. The disease affects all sheep, from 4 months old upwards. Sheep in prime condition appear to take the disease more readily than those in fair or low condition.

Out of about 500 sheep inspected while they were in the fold, where they had been resting some two or three hours, only three were picked out, as other than healthy. These three sheep attracted special attention by the stiff manner in which they walked. Otherwise they were apparently healthy. On the flock being released from the fold every one of the sheep came out lively, and apparently full of vigour. But before they had been driven 200 yards, the three sheep noticed amiss in the fold, began to tail out, and walk in a peculiar stiff manner, with back arched and nose poked out. They were soon joined by other sheep, also showing these premonitory symptoms. After driving the flock for half a mile, about 2 per cent. showed evidence of being affected with the disease. On an attempt being made to further drive any one of the sheep that showed the above symptoms, the animal, after going a short distance, would throw itself down in an exhausted condition. The exhaustion is not then complete, for if further urged, the sheep would rise and travel another short distance, and then go down again. If allowed to rest thoroughly after they first go down, the sheep will get up and walk a considerable distance, provided they are not interfered with. On the other hand, if the sheep are urged on, as soon as they go down, and are bustled about, the distance covered at each attempt becomes less and less, until they throw themselves on the ground and absolutely refuse to go further until rested. If they are now put on their feet, a trembling or shivering of the muscles of the legs occurs, hence the disease is known locally as "Shivers," or "Staggers." When the sheep are in this extreme stage the following symptoms are observed, *e.g.*, temperature high, 105 degrees to 108 degrees F., breathing hurried, about 100 per minute, and often oral, pulse weak and rapid, 140 per minute, mucous membrane of mouth blanched, although the skin retains its pinkish hue. No pain is evinced on palpation being practised over the chest or abdomen. The legs are perfectly mobile, and muscles supple. The feet carry good sound horn, and are perfectly cool. On auscultating the chest, loud crepitus is heard, but no irregularity in the heart's action is detectable. There is no evidence of pain. Neither can the other extreme condition, paralysis, be said to exist, as the sheep after a rest, move freely, and can jump over logs.

The condition appears to be one of temporary prostration attended by high temperature, weakness of the heart's action, and difficulty in breathing. With rest, these symptoms pass off. If rest be not allowed, and the sheep are further harassed, they die.

Post mortem examinations were held on two sheep selected as being the most severely affected of the flocks inspected.

Case 1. Killed by bleeding.

Carcase well nourished, skin of pinkish hue, yoke good, fleece strong.

Blood normal in colour, and coagulated well.

No effusions or extravations present.

Flesh of good colour.

Stomachs and intestine normal, with the exception of the 4th stomach, whose mucous membrane showed a small number of punctiform hyperœmic elevations, caused by the strongylus contortus.

Ingesta.—The stomachs and bowels were well filled, and digestion appeared to have been well performed.

Liver normal.

Kidneys appeared large, still not of uncommon size, for crossbred sheep.

Spleen slightly enlarged and pulp a little darker than normal.

Pericardium and heart apparently normal.

Lungs.—Emphysematous at apices. Also areas of parasitic pneumonia.

Brain and Spinal cord apparently normal.

Case 2. Also killed by bleeding.

Post mortem appearances were very similar to those of *Case* 1, excepting the spleen was larger and darker, emphysema of the lungs not so extensive and the heart larger or paler than normal.

Remarks.—From what has been stated, with reference to the clinical aspect and post mortem appearances of this disease, it will be seen to differ from any of the diseases hitherto reported, as affecting sheep in this Colony, such as Anthrax, Black Leg, Liver Rot, &c. The disease does not appear to have any serious deleterious effect on the mutton of sheep, that have recently recovered.

A definite diagnosis cannot be arrived at, until the investigation is carried further, and with a view of ascertaining whether this disease is caused by micro-organisms, cover-glass preparations were made of the blood, and of fluids from the tissues of the spleen, liver, heart and kidneys, for bacteriological examination. Culture tubes were also inoculated from the spleen and the blood of affected animals. In order to determine whether the disease is due to degeneration, not visible to the unaided eye, of some of the important structures or organs, portions of the brain, spinal cord, heart, lungs, liver, spleen, kidneys and muscle were carefully preserved for histological examinations.

The above preparations and specimens have been forwarded to the biological laboratory of the Health Department for examination.

As marsh-mallow forms the principal food of the affected sheep, arrangements have been made for Mr. Guthrie, analytical chemist to the Department, to chemically examine this plant, to ascertain whether it is deficient of some of the ingredients of food essential for the building up of healthy tissue.

This herb is known to contain an alkaloid, but it has not yet been ascertained whether this alkaloid is of a toxic nature.

GRANARIES AND ELEVATORS IN RUSSIA.

FROM a report obtained through the Foreign Office and reproduced in the *Journal* of the Royal Agricultural Society upon the working of elevators in the chief centres of the grain trade in Russia, it appears that there are at present fifty-six elevators working in Russia, one of which belongs to a local Council, another (at St. Petersburg) is a private concern, and the remainder belong to railway companies. The total capacity of these elevators is about 250,000 tons, and the quantity of wheat passed through them is nearly a million tons. The largest, at Norossisk, has a capacity of 48,000 tons; other important ones are Nikolaevsk, Odessa, and St. Petersburg. The earliest Russian elevators date from 1888, having been erected after the promulgation, in the spring of that year, of the regulations concerning the storing of goods in warehouses, which laid down the general principles to be observed in controlling the operations of granaries. Each particular elevator has, in addition, its own special rules, dependent upon local circumstances; those owned by railways are modelled upon the ordinary laws affecting railway depôts. Elevators where grain is mixed are under the control of the corn inspectors, and special regulations are in force concerning the sorting of the grain brought in. These regulations have, up to the present, been framed separately for each elevator, and are only valid pending the enactment of general regulations upon the subject. The operations undertaken by these granaries consist in discharging the grain into their store-rooms, weighing, storing, ventilating, weighing it again when taken out, loading it in sacks or on trucks, and cleaning, if desired. The price charged varies, but the average does not exceed 2¼d. or 2½ per cwt., including storage during one month. The proprietors of the elevators may also issue documents concerning the sale of, and loans on, the grains stored. In some cases they are also empowered to issue warrants and execute orders on commission.

Foot-Rot in Sheep.

GEO. C. BELLINGER,
Forest Hill, Wagga Wagga.

I HAVE many times noticed remedies given for the cure of foot-rot in sheep, and believe Mr. Stewart has given the best remedies in the *Gazette* of October last. My object now is not to refer in any way to its cure, but to express an opinion *re* its cause; and as prevention is better than cure, I hope this may prove useful to some who are troubled with this terrible disease. I believe the cause, pure and simple, of foot-rot can all be summed up in one word, "inactivity"; and to get at the root of the matter we must look for the cause of inactivity in the sheep, for I am not slow to admit that a sound sheep will always take sufficient exercise to keep it in good health, even if left alone.

Now, to begin with the life of the sheep: let us take 200 ewes to lamb, say, in the middle of a wet winter, and grant that a good percentage of these ewes are tainted with foot-rot. Now divide these ewes equally, and put into two small paddocks; one of these paddocks to be long grassed all over, and the other to have just the same quantity and quality of grass, with the *exception* of an old road or broken gully or a bare spot of some kind, sufficiently large for a recreation ground for the lambs. The lambs in the last-named paddock will have sound feet, while those in the former mentioned paddock will all be tainted with foot-rot, and very likely the balance of the ewes.

Both lots have had the same climatic disadvantages, the only difference being that the lambs provided with a recreation ground will, in obedience to instinct, or a youthful desire for frolic, take sufficient exercise to keep their feet sound, even while the poor old ewes are lying down nursing their feet.

But on the other hand, those that have no get-away from the long wet grass, will, perhaps after a few feeble attempts at play round the butt of a tree or on a log, huddle down by the side of mother, and in a very few days after the birth of the lamb the mischief is done.

This would point to the fact that foot-rot is neither hereditary nor contagious; or at any rate no more so than drunkenness is in mankind—say, a certain allurement to the same habit; and I contend that sound lambs can be bred from ewes that have the foot-rot; but lambs will not voluntarily exercise themselves in long wet grass.

Then it would appear that a superabundance of wet grass has something to do here. It has, but only inasmuch as it causes inactivity in the lamb. It is not the direct cause of foot-rot; for I have known sheep to be driven through water and mud all day and camped on wet ground all night, and this for weeks at a stretch; without their feet being affected in the slightest degree. Some one may ask—how about grown sheep that have been touched with foot-rot in their younger days? Well, I believe a sheep that has once had the taint of foot-rot will be liable to show it (more or less) at any time in after-life during wet weather; and when sheep show an inclination to lie about in damp weather, they should be kept on their feet for a reasonable time each day, on hard or stony ground. Even if the ground is wet, they will not take much harm while they are on their feet. A sound sheep will not lie about in the wet. If, by a little additional expense in keeping sheep that show a comatose tendency on their feet during the wet weather, it would do away with, or even lessen, that disagreeable task of foot-rotting, it should be a gain in the condition of the sheep.

GETTING RID OF SORREL.

MR. JACKSON CLARKE, of Spring Creek Farm, Berridale, who acts as local correspondent to the Government Statistician's Department, writes:—"Having had a great deal of trouble with the sorrel pest for many years past, I will give you my experience of the matter. It may be that our soil and conditions are entirely dissimilar to that at Milburn, New Zealand, referred to in the note in October *Agricultural Gazette*, with respect to the destruction of sorrel by the application of lime to the land; but I have ploughed my infested land in summer so as to expose the sorrel roots to the scorching sun, and have turned the roots up to the frosts in winter without effect. I have also tried all sorts of manures, but the crops sown can get no benefit from them, and they only feed the sorrel. The more you cultivate the pest the more it spreads. In my opinion, the cheapest way to exterminate sorrel is to give the soil absolute rest; then either smother the weed or feed it off with sheep. I have smothered several small patches by covering them with wheaten husks (about 6 or 7 inches thick), and have smothered some patches with wood ashes laid on about 3 inches thick. Earth should be thrown on the husks and ashes to keep them from being washed or blown away. Some time ago I had a small paddock red with sorrel. I pulled the wires out of the fence to allow the sheep free access to it. The first season they did not take kindly to the sorrel, but by the second season they had become very fond of it, and the plants did not get a chance to bloom. Now the pest in that paddock is entirely destroyed. While on the sorrel the sheep were allowed a liberal supply of rock salt."

Mr. Clarke expresses the opinion that a sorrel diet, with plenty of rock-salt, is good for fluke-infested sheep.

Our Salt-bushes.

T. E. GRIGG,
Fareham.

In America our Australian Salt-bush is held in high esteem, and it is doubtful if in any other part of the world it receives as much attention as it does there. For some time they have been experimenting to prove its value as a fodder plant; and, from reports that reach me from time to time, the pastoralists have a very high opinion of our salt-bush. Now, I think it is time our own settlers had more information supplied to them concerning this valuable family; but I can see that this will be a matter that will take a considerable time, for our settlers have to be educated up to the value of these plants. At present, holders of western land do not take the interest in them that they should. One of the drawbacks is the lack of common names for these plants. The majority of our settlers will listen to you if you get into conversation concerning the merits of the Old Man Salt-bush or the Plain Salt-bush, and I have yet to meet the settler that does not know the value of the Creeping Salt-bush; but there their interest seems to stop. And not only our settlers, but if you take up any one of the catalogues issued by our leading seed-merchants you will find that they only catalogue from two to three varieties, and certainly the very best plant—*Atriplex vesicarium*, or the Bladder Salt-bush—is not mentioned. This is the plant that in former days covered hundreds of thousands of acres of our western plains. This is the plant that is slowly but surely being killed by over-stocking. I have made inquiries from some of our oldest settlers, and they say that the plain salt-bush is the very best of the salsolaceous family. Now, I think that there is a splendid opportunity for our settlers to cultivate and experiment with these plants, and in a few years we should have our salt-bushes restored to their former prominent position. Von Mueller, in his "Salsolaceous Plants," describes ninety-six specimens of this most interesting family, but I am afraid that it would take one a long time now to find half that number in our western-central district, particularly amongst the creeping varieties. I am afraid that some of them have gone for good, for they get no chance in country that is heavily stocked, and the majority of our settlers do not think it worth while saving them. It seems so strange that our settlers should let thousands of acres of salt-bush die without trying to save it; they seem to think that if the salt-bush dies the grass will grow better. It is just the old story of the goose and the golden egg over again. After the rains in May last, when our salt-bush plains had a nice coating of grass and herbage, in no place did the grass respond better than through the old dead salt-bush tussocks; hence they say, kill the salt-bush and the grass will grow better, quite forgetting that for years the salt-bush has gathered and held fast the dead vegetable matter, soil, dust, &c., that is blown over the plains every day; quite forgetting that the despised salt-bush has formed a natural seed bed for the grass and herbage. Let the salt-bush die and there start the scalded plains. The grass gets burnt up and has not the power to hold the soil together, the constant dust storms do the rest, and in a few years we have another scalded plain. I would strongly advise our settlers to cultivate the Plain Salt-bush, which does not want much attention and will produce an abundance of leaves and shoots; it is a quick grower, and if the stock are not kept on it too long will speedily recover. Another bush that receives great attention in America and South Africa is the creeping salt-bush *Atriplex semibaccata*, this plant will cover a lot of ground and has a very high feeding value; besides it can be grown with the former to the advantage of both. I cannot close this without a word for the Old Man Salt-bush. Now is the time our settlers should gather the seed and then when the rain does come they will be ready to plant it out. I was talking to a gentleman who has had over forty years experience with salt-bush, and he places the Old Man above all others, for in his opinion, it is absolutly drought-resistant.

TRANSPORTATION OF QUEEN BEES.

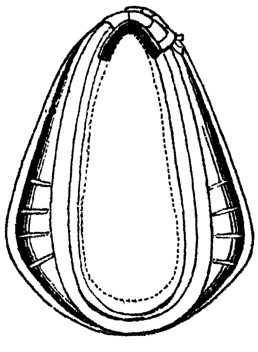
ON several occasions when the Department has obtained humble bees from abroad, and on liberation in this Colony, difficulty has been experienced in carrying the insects safely and landing them alive. The same trouble is frequently experienced by importers of queens from Europe and other distant places.

In a letter to the Government Entomologist, Mr. M. G. Dervishian, of Nicosia, Island of Cyprus, mentions that he has, after a great many experiments, been able to improve the ordinary shipping cage with very satisfactory results. He finds that bees can stand heat and confinement for a long time, provided they have an adequate supply of pure water, and in the arrangement of what he calls the "ideal queen mailing box," Mr. Dervishian has made provision for a supply of water, as well as candy, made of icing sugar and honey, all separately, in several receptacles, so that neither the water nor honey can run out. He has had bees carried in such a cage for three months, and at the expiration of that time they came out fat, full of honey, and very lively.

Horse Collars.

A WRITER in *Farming* gives some details about horse collars that everyone who uses horses for heavy work should cut out and paste up in the stable. The pain and discomfort to the animal and loss to the owner through diminished capacity for work and spell days to recover from injuries to the shoulders resulting from an ill-fitting collar are to a great extent avoidable by the use of a collar especially made for the horse, and by the exercise of care on the part of the driver in adjusting the draught and in keeping the lining free from hardened accumulations of sweat.

"The ready-made collar manufacturer stuffs and shapes the collar over an inanimate form, intended to represent the shape of a horse's neck in breadth and thickness, the material being thoroughly soaked and as limp as a rag; it is then left to dry. The collar is then so firm and stiff that in many cases it is impossible to buckle the hames tight enough to bring the collar to the shape of the horse's neck. Thus the shoulders are often compelled to adapt themselves to the collar, rather than the collar to the shoulders.



"The illustration shows a good form of collar, with dotted lines representing where the neck of the horse is much narrower than the collar; also dotted lines to show the different heights at which the hame tugs should be adjusted on the collar to suit the size and shape of the horse. The adjustment of the hame tugs so as to bring the draught on the shoulder to the proper place is a matter that deserves the closest attention. If the draught is too low, the movement of the shoulders in walking gives too much motion, back and forward, to the collar, and is almost certain to cause soreness, both at the points of the shoulder and at the top of the neck; and if the draught is too high, the injury will be equally as great. There is just a proper place (according to the conformation of each and every horse) for the draught of the hame-tug, and the driver should be observing enough to know where that is, as no rule can be given that will be sufficient for all horses. It is not a bad plan, when commencing with a young or strange horse, to fit the tugs where you think they should be, and then keep careful watch of the animal during a stiff pull. If it appears distressed and throws its head too high or strains down, you may take it for granted that there is something wrong with the draught adjustment, and raise or lower it until the horse can work comfortably. If the collar is too long for the horse, the hame-tugs should be raised; if the shoulder is very oblique (slanting), the tugs can be lowered to advantage. When the hame-tugs are just at the proper place, there will be but little motion at the top of the hames as the horse walks along; but when too low there will be seen a weaving back and forth of the hames at the top, which shows that the draught is too near the point of the shoulder, and the collar is kept in constant twist, one way or the other, which is very injurious to the shoulders and the top of the neck. This is generally the condition when the top of the neck and the points of the shoulders are sore at the same time. The hame straps should always be arranged to suit the form of the horse's neck at the top and bottom, the lower hame strap being buckled as tight as the thickness of the horse's neck will permit.

A Method of securing a Perfect Fit for a Ready-made Collar.

"Select a collar of the size and form best suited to the horse, put it in a vessel of water, let it remain over-night, wipe off the surplus water in the morning, put the collar on the horse, and by means of the hame straps draw it snugly to the sides of the neck from the top to the bottom; then work the horse moderately through the day, and the collar will be better fitted to the horse and to every inequality of his shoulders than the best expert in the country could do over an inanimate form. This is the best, the easiest, and most perfect method of fitting a collar that can be recommended. 'If collars have been fitted to horses by this method in spring, when they were fat, and they have been worked down thin in flesh, it will be necessary to soak the collar again and re-adjust as before."

"The shoulders and collar should be kept scrupulously clean, and when the horse is doing very hard work a weak solution of salt and water, and sometimes a decoction of bark, as a wash for the shoulders every night is found to be excellent in practice."

From the above hints it ought to be comparatively easy for any horse-owner or driver to largely prevent shoulder troubles; but, as the writer points out, the condition of a horse materially affects the shape of his neck and shoulders. Besides, in particularly heavy work, such as ploughing virgin land or hauling on badly cut-up roads, and where animals are but recently broken in or are off the grass, shoulders will get chafed sometimes in spite of a well-fitted collar. To guard against this, and to enable a tender-shouldered horse to recover, pads or false collars are found useful, and there are several on the market that find favour among drivers. The India-rubber, Gutta-percha, and Telegraph Works Co., of 279, George-street, Sydney, some time ago forwarded for trial at the Hawkesbury Agricultural College a false collar on the pneumatic (air-inflated) principle, known as "Clements' Patent False Collar." It was some time before a sore-shouldered horse became available. At length the false collar was tried on a newly-broken horse with very bad shoulders. Mr. Valder found that by using the collar it was possible to work the horse continuously, and the sores healed rapidly. The false collar has since been tried on several horses with very sore shoulders, and in every case it proved effective.

Revised Notes on the Cultivation of Broom Millet for Manufacturing Purposes.

THREE years ago, Mr. Dunnicliff, Manager of the Bathurst Experimental Farm, commenced a series of trials to test the suitability of the Bathurst district for the production of broom millet. He obtained the necessary broom-making machinery, and at the Bathurst Agricultral Society's Show, has given practical demonstrations of the class of article that can be manufactured from the locally-grown millet. Mr. L. Peate, of George-street, Bathurst, made arrangements to take over Mr. Dunnicliff's appliances, and, according to the *Free Press*, has met with such success that he has found it necessary to procure larger machinery to cope with the demand for the manufactured articles.

A good deal of seed has been distributed throughout the Bathurst district to farmers, who find a ready sale at remunerative prices for all the broom material they can grow. In consequence of this, there has arisen a considerable demand for information as to the culture of the crop, and it is thought readers of the *Agricutural Gazette* will appreciate the reproduction in revised form of the article that Mr. Dunnicliff wrote on the subject in September, 1896.

"Having been asked to furnish a little information respecting the cultivation of millet for broom and brush making, I must state, in the first instance, that there is not an unlimited market for the product, and I do not advise a large section of our farmers to rush into millet growing; but still there is plenty of room for many more of our settlers, who are favourably situated as regards soil and climate, to cultivate this crop before the demands of our local markets may be overtaken, and, at the present time, it is one of the most profitable crops that can be brought under their notice. The only reason that I can give, why our farmers do not produce sufficient material for making all the brooms required here, instead of allowing thousands of pounds to be annually sent out of the country for that purpose, is that they do not know how readily they might secure the money for themselves and their families.

"It is a crop almost as easily and simply grown as a crop of hay; the labour is light, the outlay to secure it is trifling, and the profits good; with a careful and intelligent grower they are very good.

Soil.

"The soil most suitable for the growth of millets, is an alluvial, or a rich strong loam capable of being worked up fine; but almost any well-wrought farm lands which will carry good maize, potatoes, and the ordinary crops, will answer very well for millet.

"It is necessary that the land for this crop, especially if intended for broom-making (and I shall keep this latter point in view all through my remarks), should be very well prepared, and clean. It should have one or two good deep ploughings, and cross-ploughings, with harrowings, to pulverise it, and bring it up to a good tilth.

Planting.

"Sowing may commence at any time after the beginning of September, or whenever is the local time for maize planting, and be continued as opportunities permit, all through the Spring and into the Summer; but as the early sowings give the finest crops, both in quality and quantity, it is in the interest of the farmer to earnestly endeavour to get this crop planted and well established as early in Spring as he can.

"The land having been well and finely wrought, and rolled down, the drills may be struck out at 3 feet, or 3 feet 6 inches apart, and about 4 inches deep.

"The seed does not require a large amount of moisture to germinate it, but if the season inclines to be dry, the drills should not be kept long open, or needlessly exposed to the sun or drying winds before sowing and covering in. After the drills are closed, a light roller should go over, to help retain any moisture in the land. If only a small acreage is to be planted the sowing of seed may be done by hand, through the fingers, and with very little practice a youth may sow, almost at his usual walking pace; or the seed may be mixed with dry earth or ashes, &c., and sown through an old teapot or other utensil.

"Should this hand-sowing be found tedious, and machine-work be preferred, the seed may be sown quickly and well by using the 'Planet Junior Seed Drill,' a cheap and most effective machine, the work of which leaves almost nothing to be desired. Of late I have been using the ordinary wheat drill by stopping up some of the deliveries.

"Care should be taken to let the seeds drop regularity in the drills, and for the plants to stand about 3 inches apart in the rows, should the land be in good heart. If, however, the land is inclined to be light or poor, then less seeds must be put in so that the plants may be further apart; otherwise they will not develop freely, and the heads will not attain the desired length and perfection which alone brings the highest price in the market. At the same time, whilst *length* of head is desired, *coarseness* must be avoided.

Cultivation.

"As soon as the drills or rows are discernible, the crop should be cleaned by running the scarifier or horse-hoe between them, and working close up to the plants. This will not merely kill all the weeds but will greatly stimulate the growth of the young plants, and is very important at this time. Then, should the plants stand too thickly, the weaker ones may be pulled or cut out with the hoe, leaving the strong ones to grow on. With a thick growth the heads are frequently stunted and inferior.

"When the young plants are 6 to 9 inches high, they should be hilled, or earthed up, in the same manner as maize, potatoes, &c. Whether this is done at one operation or two, may be left to the discretion of the grower; but it is necessary that it be done early (earlier than is usual with maize), and before the surface roots extend between the rows, which they do very quickly. If possible, this should be done immediately after rain, or whilst the dew is on the crop in the early morning. The intervening space may be occasionally scarified to keep the ground clean, and the soil loose and retentive of moisture. This may be continued during all the time the crop is making its growth.

"Beyond the foregoing, no special attention is required, until such time as the crop is arriving at maturity, usually four to five months after sowing.

Harvesting and Curing.

"In selecting the time for cutting this crop, the grower must exercise as much judgement as in determining what day he shall cut his wheat or hay.

"Presuming the crop is being grown for manufacturing purposes, it will reach its greatest perfection when the seed is properly formed and filling; but before the grain hardens or *the seed stems colour*. Should the seeds, either by negligence or accident, be allowed to fully ripen, as in the case where the crop is grown specially for the seed grain, the seed stems become pithy and brittle, and of little or no value for manufacturing purposes.

"In the work of cutting, boys of fourteen or fifteen years may be employed, and are usually as good and quick as men. The heads are bent down by the cutter, and taken off with a strong knife, leaving about five to six inches of the stalk attached. A labourer follows and cuts down the stalks from which the heads have been removed, and they are left on the ground until ready for burning, or otherwise disposed of. The heads when cut are placed in small thin heaps, on some of the fallen stalk in preference to the ground, and allowed to dry in the open air for a couple of days, or if the weather permits until they attain a bright silvery colour; on no account should they be cut or handled whilst damp. Field-curing may be facilitated by frequent turnings. The crop is then removed to a large shed and stacked until it is convenient to strip off the seed.

"Should the weather not allow of the crop being cured in the field it must be carted to the shed and spread out on benches, or straddles, or the floor (say) about 6 inches deep, and then must be turned every day. When cured in this way—and some maintain that this is the proper one—the crop retains a light-green tint, which is desired by some manufacturers, who will sometimes pay a higher price for it, according to special trade or work. It is not usual, however, to adopt this plan, unless weather conditions compel it, because a very much larger shed is required for this purpose, and a great deal of extra labour is entailed. But whatever system of curing the grower may select, he must make every effort to give his product a fine colour, as it so largely influences its selling value.

"Hackling or stripping the seed off the heads is the next operation. For this purpose a small machine is necessary, consisting of a rapidly-revolving roller or drum, studded with iron teeth, about 2 inches or 2½ inches long. The heads are not put through the machine in the same manner as the cereal crops with the ordinary thresher, but are merely inserted to the depth requisite for cleaning off the seeds and then withdrawn, the work being effectively and expeditiously done, and the pins or stems remaining unbroken or otherwise injured.

"The cost of this machine, or 'hackler,' is from 55s. to 70s. for hand-power, and from £8 10s. to £10 for horse. The former is sufficient for a farmer growing only a few acres, and the work of hackling may be done at any time when most convenient, provided the heads are dry enough.

"The heads being now ready for sale are tied in bundles or put into bales and pressed. The sizes of bales most liked are those weighing 400 lb. to 500 lb. each.

General Remarks.

"The foregoing particulars contain the salient points connected with the cultivation of this easily-managed and profitable crop; but at the same time there are a few other matters deemed worthy of consideration by intending growers. The cultivation of millet for manufacturing purposes, simple as it appears, is like most other things—in the fact that if it is worth doing at all it is worth doing well; and the man who combines care in details with industry, is the one who will find it most profitable.

"The following points should be watched as essential to success:—

The selection of a good strain of seed.
An early and favourable planting.
Constant attention in harvesting and curing.
Systematic baling, according to quality.

Seeds.

"In dealing with the first it may perhaps be necessary to state that some varieties of millet are more suitable for our present object than others; and it will be in the interests of farmers to study the wants of buyers, and produce accordingly. When a farmer has got a good strain of seed, and one that suits his requirements, it is wise for him to pay some little attention to the production of seed for his own purposes at least. This may easily be done by passing the best heads when cutting his crop and allowing them to mature their seeds. In this way the standard of quality may readily be kept up, or even improved, without any special effort or outlay; or a small plot of ground might be specially prepared and cultivated for same purpose.

Varieties.

"The varieties usually grown are known as 'Red,' 'Evergreen,' and 'Italian.' The Red, whilst giving a bulky yield, is not valued by broom-makers for making best quality goods, the market value for heads ranging from 5s. to 15s. per cwt. It may be profitably grown for grain, or feeding purposes, for which it is better adapted. It is a prolific seeder, frequently yielding, on good land, 40 to 60 bushels per acre (60 lb. to the bushel), and is saleable. It is a good food for poultry, and if boiled, or scalded, is a really first-class food for pigs and horses, as I have personally proved. The Evergreen and Italian are better suited for the manufacturer than the Red; but the variety held in most favour at the present time is the 'White Italian.' This is a comparatively new introduction, and, whilst being a good yielder in respect of weight per acre, gives at the same time a head of extra length and fineness, and of a tough, wiry nature. It is much esteemed, and very saleable, ranging in price from 15s. to 35s. per cwt., the returns in weight of heads averaging 15 to 20 cwt. per acre. At the time of writing this article I have before me average samples of heads (not the best) collected by me from a crop grown under ordinary small farm conditions. They measure 33 inches clear of the stem, are fine, wiry, tough, and a bright, clear colour, such as would be eagerly bought by manufacturers. This matter brings me again to the question of

Early Sowing,

which I have already emphasised. At the risk of a charge of reiteration I must remind growers that the early-sown crops produce not only the largest yield, but also the finest quality of heads; and are also able to attain their growth and perfection at the time most favourable for successful harvesting and curing. When the farmer delays sowing until late, he shortens the time available for growth before Nature hastens the maturing of seed; consequently, his returns are deficient in weight and quality, and therefore in value. To this must be added the extra difficulties which frequently attend the saving and curing of late crops through unsettled autumn weather, with consequent loss of colour also.

'Heading,' or 'Topping.'

"I find in districts where millet is grown to any extent, that while some growers are in favour of the practice of turning down the heads, other experienced cultivators do not regard the method with favour. It may be advantageous where the red and other strong varieties are grown, inasmuch as it has a tendency by the weight of seed to induce a straight growth of stems, yet in the finer sorts, as the White Italian, such help is not usually needed. Growers also complain that too large a number of the plants so treated die off, and further, that it is a matter requiring daily attention, probably at a busy time. When bending is preferred the stalk should be *bent*, about a foot below the brush or head, and great care must be taken not to *break* it.

Baling.

"In baling for market it has hitherto been the custom to place all sizes and qualities of heads together in the bale, just as they came to hand, believing that the good heads sell the inferior ones; but from both grower's and manufacturer's point of view this is a decided mistake. The crop should be classified into, say, three or four lots, according to lengths and qualities. Each lot should be baled separately, so that a buyer could take exactly what quality he wanted, without having to buy what he did not wish, for which he naturally gives a much lower price than he otherwise would.

"If the suggested system be followed, I am assured by buyers that all the qualities would sell at their respective values, and the total returns would average much higher than under the present mode of baling and selling the crop. The majority of our New South Wales farmers are not noted for the excellent manner in which they place their products on the market, but those who have paid any attention to this point of farm management have always found that it pays them. Depend upon it that the farmer who, like any other business man, studies and meets the wants of buyers, is also studying his own interest at the same time.

"Finally, I commend the culture of millet for broom and brush-making to those farmers whose soil and climatic conditions are suitable, and who, having the help of a family to perform the light labours required, may produce it at a nominal cost, and find both profit and pleasure in the occupation."

COFFEE CULTURE ON THE CLARENCE.

MR. JOHN BALL, of Chatsworth Island, reports that his coffee crop this year is a great success. His last crop returned 1,694 lb., which sold at 1s. to 1s. 3d. per lb. This year the crop is expected to amount to something like 6,000 lb. Mr. Ball has mastered the manufacture of coffee of the highest quality, and finds a good demand for it. His trouble is to secure sufficient quantities of beans. In reply to inquiries made of Mr. Holmes, a planter in Fiji, Mr. Ball has been informed that, owing to unsatisfactory prices offering in Sydney for the Fijian bean, the growers there were abandoning coffee-growing. Mr. Holmes forwarded Mr. Ball some seeds of the Liberia coffee, which is a sturdy-growing tree with deep tap root, and which bears a larger berry than the ordinary Arabian variety. In Fiji, even at the extremely low prices (3d. to 5d. per lb.) paid for the beans, this variety returned 4s. 7d. per tree. Mr. Ball finds that he can pay 10d. a lb. for good beans. His harvesting is done by lads, who are able to earn 15s. a week at the work.

On Forest Planting.

BY WALTER GILL.
Conservator of Forests, South Australia.

THE two main methods by which young trees are planted in South Australia are those termed respectively the "open root" system and the "bamboo tube" system.

The trees grown on the "open root" system are reared from seed sown in lines in the open ground in the nurseries. They may be one year or two years old when taken up, and on removal are generally placed in boxes containing liquid mud, or "puddle" as it is termed. The object of this is to protect the fine roots from exposure to the exhausting effect of the dry atmosphere. It is not usual to remove at a time more than can be used during, say, a day's planting, if planting is being done adjacent to the nursery, or two or three days planting if the distance be considerable. Out in the field the trees are kept well protected with a light screen from any trying heat, and kept moist by watering as needed. It is usual to plough the ground quite 6 inches for planting on land of a tenacious nature, say, a clay loam; but sandy, easily worked land may not require ploughing. The ploughed land is generally well worked with the spade by the planter, and on these well worked sites holes are opened large enough to admit the young tree easily, without in any way cramping the roots or turning them up. This is a very vital point, blundering here is fatal. The planter must insert the tree and fill in the soil without cramping or turning up the roots, which should be placed so as to admit of their taking the direction toward which they naturally tend. Usually, so many men spade the ground, and so many plant trees, working in pairs.

The kind of trees usually planted "open root" in South Australia by the Forest Department are the Remarkable pine (*P. insignis*) the Cluster pine (*Pinaster*) the Aleppo pine (*P. halepensis*) the Stone pine (*P. pinea*) the Corsican pine (*P. laricio*). I usually get the pines in as early as the season will permit—June and July being the months when they are generally put in in the drier, northerly parts; but further south they can be planted at least two months later. As they are generally in early enough to secure the benefit of good spring rains, the percentage obtained is invariably over 90, often over 95.

All deciduous trees are planted on the same plan; but it is only very occasionally that such trees are planted, the land available being seldom suited for the trees of the more temperate climates on any but very limited areas.

The "bamboo tube" system is that in connection with which sections [Fig. 2] of the plant commonly called bamboo (*Arundo donax*), really a reed, are cut to a length of say 5 inches, placed vertically as close as possible together on the floor of the nursery pit and then filled with properly prepared soil. The work of filling this into the tubes is much aided by the use of the rough beater [Fig. 1] in adjoining figure. This

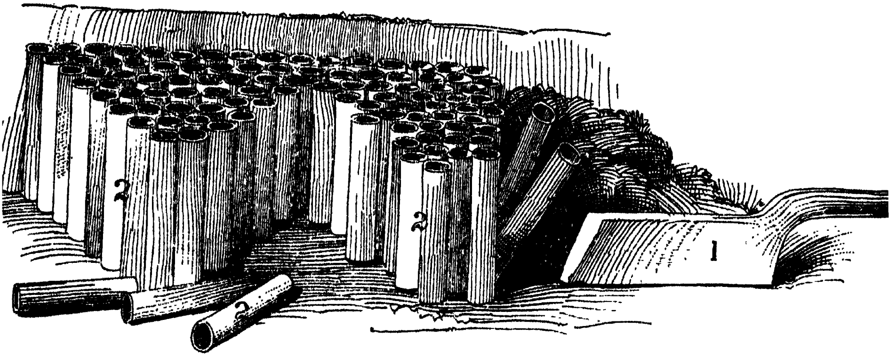


Fig. 2. Fig. 1.

is readily made from any hardwood, and, by steadily beating the tubes on the top, the soil, by concussion, settles right down to the bottom of each tube. After all are properly filled, a little pinch of seed must be sown in each tube, and, with judicious watering, the seedlings appear in due course. In South Australia most of the native spring waters fail to germinate seeds; rain water, therefore, must be used. A little after the plants show the first leaf proper, they are carefully sorted over, the low plant tubes being shifted to another part of the pit, and the tubes that are empty are withdrawn for use again.

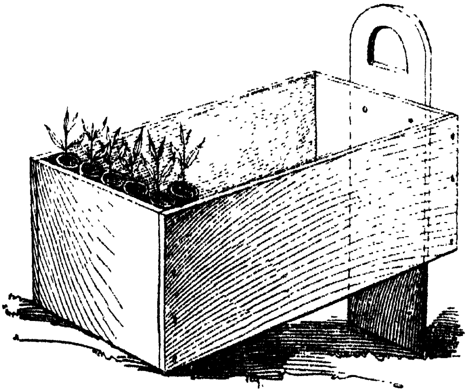


Fig. 3.

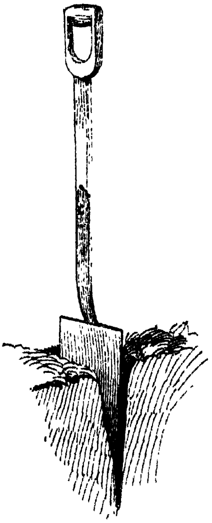


Fig. 4.

The tubes may vary in diameter from ½ inch to 1 inch, but should not be obtained from very old bamboos, or else they will not root when planted out. As a rule, all our gums are reared for planting in the tubes, this being by far the best and most economical in rearing, planting, and carrying over long distances; while, at the same time, proving safer than any other system, as far as root exposure is concerned. The tube plants are taken to the field in planting boxes [Fig. 3], simply made, so that they rest on a short foot, which keeps them tilted up. This has the effect of keeping the moist liquid mud at one end, so that it remains around the tubes, the bottoms of which are thus absolutely shut off from the dry air, preventing root exhaustion entirely. The men work in pairs. The spaders work the ground well, then drive down the spade, and make a cut by working it backward and forward [Fig. 4], leaving the cut open. The planter then places the tube tree therein, but must be exceedingly careful to see the tube bedded right to the bottom at *a*, and not to leave it at *b* [Fig. 5]. If he did that, when the tree started to throw out fresh roots, tender and white at the base of the tube, they would come out into the empty space indicated by the black spot between *b* and *a*, and perish. The tree might try others for a short time, but ultimately it would perish. It is always well to place the tree as far under the soil as possible [Fig. 6], because the tube is more certain to decay when well in ground, as the damp can act on it better than when it shows on the surface [Fig. 7]. Not only so, but the lower you can get the bottom of the tube the cooler is the soil, and the less can the heat affect the general vitality of the little plant. Anchor roots also often form at *d*, and help to steady the tree from wind action. A little after planting, the trees are generally lightly hoed, or spaded, or forked round according to the requirements of the soil, and this prevents the ground from caking, and hinders the capillary action of the sun. Precipitated moisture, however light, is the better retained, and the ultimate growth of the trees better secured in this way. The system of rearing trees in pots can only be followed where limited areas are acted on and special results are desired, as the cost is excessive in rearing, transit, and planting, compared with the two methods previously indicated.

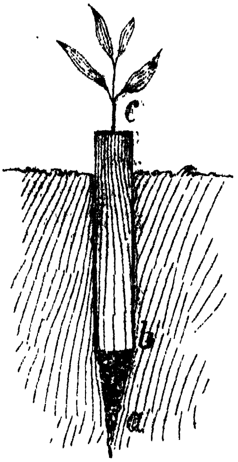


Fig. 5.

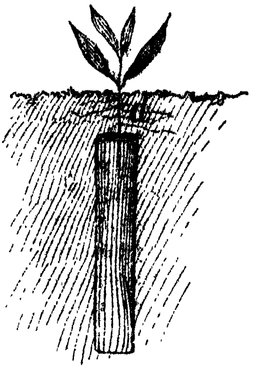


Fig. 6.

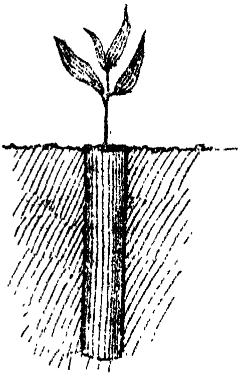


Fig. 7.

Note on the Soils of County Camden.

F. B. GUTHRIE AND C. R. BARKER.

THE soils of county Camden are for the most part derived from the Hawkesbury sandstone which forms the country rock over most of the county. To the north of Picton, Wianamatta shale is the prevailing formation, and more or less extensive outcrops of volcanic rocks, chiefly basic, occur in different parts.

Thus the soils about Bowral and Mittagong, Exeter, Wingello, and a few other places are frequently of volcanic origin.

In the south-east portion of the county and more or less along the coast are the Bulli coal-measures. Only a few soils, however, have been received for examination which can be regarded as having been derived from Permo-Carboniferous rocks, and these will not be included in the summary.

By far the largest number of the soils examined have been derived from Hawkesbury sandstone, and the following table gives the average chemical composition of such a soil calculated from about eighty soils examined from different parts of county Camden, excluding those derived from volcanic areas or from the coal-measures:—

AVERAGE composition of virgin soils from County Camden.

Nature of soil	... Light, sandy loam to clay loam.
Reaction of soil	... Neutral to strongly acid. (42 per cent. of the soils examined were strongly acid.)
Capacity for water ...	= 49·73 per cent.
Organic matter (humus)	= 11·23 ,,
Lime	= ·113 ,,
Potash	= ·102 ,,
Phosphoric acid	= ·171 ,,
Nitrogen	= ·231 ,,

As the above represents the average soil derived from Hawkesbury sandstone in this part of the country, it may be of interest to compare it with the sandstone soils derived from the same formation in county Cumberland (*Agricultural Gazette*, N.S.W., May, 1898).

The figures there given are the following.—

AVERAGE of virgin soils from Hawkesbury sandstone (Cumberland).

Organic matter (humus)	= 7·22 per cent.
Lime	= ·106 ,,
Potash	= ·066 ,,
Phosphoric acid	= ·137 ,,
Nitrogen	= ·133 ,,

As might have been expected, the soils are very similar, the Camden soils being as a rule better supplied with humus than the Cumberland, and possess consequently more nitrogen and a higher capacity for retaining water. In lime, potash, and phosphates they are also slightly but consistently higher, and, generally speaking, are more fertile soils.

General Treatment.

With regard to the treatment which will bring the land into the best condition and increase its natural fertility, much the same remarks apply as in the case of the Cumberland soils. The first essential is the addition of lime in which this type of soil is deficient, and the addition of which, besides supplying this ingredient, counteracts the acidity of sour soils, renders certain mineral food-stuff soluble, improves the texture of the soils, and promotes nitrification.

Proper cultivation and drainage are of course essential to the maintenance of a fertile soil. Green-manuring, in order to supply humus and nitrogenous matter if the proper crops are selected. The soil-humus is one of the most important ingredients in the soil, not on account of the plant-food it contains, but on account of the way it modifies the texture of the soil, and particularly for the resistance it offers to the evaporation of moisture from the surface, a property of incalculable value in a climate like our own subject to protracted dry spells. In countries where a more intensive system of farming is carried on, this organic material is supplied by means of the straw or litter in the farm-yard manure, 10 to 15 tons of manure being an average dressing.

Comparison of Green Manuring with Farmyard Manure.

A FAIR crop of clover ready to plough under weighs about 1 ton; if the whole of this is ploughed under we shall return to the soil the phosphates of potash extracted from it, amounting to about 42 lb. potash and 12 lb. phosphoric acid, and, in addition, are supplying about 50 lb. nitrogen which was not in the soil before the clover crop was grown. To supply this amount of nitrogen by means of farmyard manure we would have to add about 6 tons of stable manure to the acre. On this account leguminous plants such as clover, cow-pea, lupins, &c., are more suited to green manuring than such crops as oats, rye, &c., which latter provide only humus by their decay within the soil, and do not enrich it with nitrogen to the extent that leguminous crops do. With regard to which is the best crop to grow for this purpose, there is great need of proper experiments under our conditions. The crop must be one which makes rapid and heavy growth in the particular district and soil; it should, if possible, be a fairly deep-rooted, large-leafed crop. It must also be capable of being easily turned under. Cow-pea, which is the crop most commonly used here for this purpose, has the disadvantage that in districts and seasons where it makes good growth it becomes rather unmanageable for the plough, on account of its woodiness of stalk. On the Continent of Europe lupins (blue and white) are extensively used for the purpose of green manuring, and appear to answer all the requirements of a quick-growing leguminous crop. They would well repay a trial for this purpose under local conditions.

WE regret that, owing to an unavoidable delay in its preparation, the map of county Camden showing the distribution of the principal rocks, which was to have accompanied this article cannot appear in this issue. It will be published in a later issue.

Milk and Cream Tests.

ACTUAL CHURN RESULTS *v.* ESTIMATED RESULTS.

M. A. O'CALLAGHAN.

THE South Coast Agricultural Union asked the Minister for Agriculture in 1899 that I be allowed to carry out some tests with a view to determining what ratio the butter-fat supplied to creameries bore to the commercial butter produced; or, in other words, to determine what is called the average percentage of "overrun" of commercial butter over butter-fat. I pointed out that such tests, to be of any value, would require to be carried out at different periods of the year and in different parts of the Colony, and also that it had been a long recognised fact that creamery butter, on the average, analysed about 84 to 85 per cent. of butter-fat, thus allowing an overrun (water, salt, casein, &c.) of about 16 per cent. This was about the average of all the tests made at the Great Columbian Exhibition. I have, with the assistance of my field assistant, Mr. Pedersen, completed a number of tests carried out in factories situated in different parts of the Colony, and I now give the results of the calculations and results from the milk tests. Before proceeding further, however, I wish to explain the system generally in vogue at the present time in this Colony for estimating the amount of commercial butter which milk suppliers to factories shall be paid for. When the Babcock machine was introduced into England, Messrs. Lister, of Dursley, issued with each machine a chart or ready-reckoner to enable anyone to calculate therefrom how much butter could be produced from a given quantity of milk, provided it was known what was the butter-fat test of the milk per Babcock machine. This chart assumes for basis that butter contains 85 per cent. of butter-fat, and that the average loss in separating and churning comes to ·22 of 1 per cent. of butter-fat. Thus using their chart, supposing milk tests 4·0 per cent. of butter-fat, we deduct ·22, leaving the test at 3·78, then we see that 100 lb. of such milk will leave 3·78 lb. of butter-fat net to go towards butter manufacture; and using the ratio, 85 to 100, we get the result to be 4·44 lb. of commercial butter. Several charts on the same or nearly similar basis have been published here, the best-known being that by Mr. C. C. Lance. The reliability or working accuracy of these charts has been questioned by farmers from time to time, but from the results I have obtained it would seem a difficult thing to suggest a simple and more accurate means of calculating each supplier's proportion of butter.

MILK TESTS.

No. of Tests.	Date.	Milk, in lbs.	Butter-fat in whole milk, by Babcock machinery.	Total butter-fat, as calculated from two previous columns.	Commercial butter made.	Percentage of butter-fat in separated milk, per Gerber method.	Percentage of butter-fat in butter-milk, per Gerber method.	Total actual loss in separated milk.	Total actual loss in butter-milk.	Butter-fat per cent. in whole milk, by Gerber method.
	1899.							lbs.	lbs.	
1	16 Oct.	9,067	3·6	326	365	·20	·60	16·7	4·0	3·8
2	17 ,, ...	9,436	3·6	339	386	·20	·40	17·4	3·4	3·8
3	18 ,, ...	15,618	3·8	593	657	·20	·70	28·6	9·8	3·9
4	19 ,, ...	10,082	3·8	383	347	·25	5·40	18·1	70·0	3·9
5	20 ,, ...	16,106	3·6	579	646	·15	1·20	21·6	23·4	3·7
6	21 ,, ...	9,889	3·8	375	420	·20	1·25	17·9	10·0	3·9
7	22 ,, ...	20,142	3·6	725	817	·20	·75	36·4	12·0	3·7
8	23 ,, ...	16,132	3·6	580	674	·20	·90	28·8	15·0	3·8
9	26 ,, ...	46,010	3·6	1,656	1,843	·20	·35	82·7	14·0	3·7
10	27 ,, ...	18,414	3·8	699	784	·30	·20	50·3	3·0	3·9
11	28 ,, ...	38,684	3·8	1,470	1,679	·20	·30	69·9	8·0	3·9
12	29 ,, ...	39,122	3·7	1,447	2,458	·25	·53	128·7	24·0	3·7
13	30 ,, ...	17,934	4·0	717						4·1
14	1 Nov.	21,276	3·6	765	885	·15	·35	29·0	5·0	3·7
15	2 ,, ...	21,324	3·6	767	842	·20	·60	30·0	8·0	3·8
16	3 ,, ...	21,178	3·6	762	878	·20	·40	38·4	4·0	3·7
17	4 ,, ...	21,462	3·6	772	879	·20	·30	38·8	4·0	3·7
18	23 ,, ...	3,102	3·8	118	131	·20	·30	5·7	1·0	3·85
19	24 ,, ...	3,107	3·8	118	133	·20	·60	5·7	1·0	3·85
20	25 & 26 Nov..	6,071	3·8	230	264	·20	·20	11·2	2·0	3·85
21	27 Nov.	3,005	3·8	114	121	·15	4·0	4·1	10·0	3·9
22	1 Dec.	21,648	3·7	801	919	·20	·40	40·6	4·0	3·8
23	2 ,, ...	22,084	3·8	839	1,874	·25	·35	102·1	8·0	3·9
24	3 ,, ...	21,572	3·8	819						
25	4 ,, ...	21,991	3·8	835	943	·20	·50	41·3	6·0	3·9
26	5 ,, ...	22,272	3·8	846	978	·15	·40	30·4	5·0	3·9
27	16 ,, ...	15,834	3·5	554	590	·25	·70	36·4	8·4	3·7
28	17 ,, ...	15,826	3·5	553	604	·30	·60	43·3	7·2	3·7
29	18 ,, ...	15,694	3·6	565	616	·25	·60	34·8	7·0	3·8
30	30 & 31 Dec..	16,061	3·7	594	682	·20	·90	29·3	12·6	3·8
	1900.									
31	1 Jan.	7,764	3·7	287	672	20	·70	14·2	13·6	3·8
32	2 ,, ...	7,723	3·8	293		·20	...	14·0	...	3·8
33	3 ,, ...	7,518	3·7	278	616	·20	1·0	26·5	16·0	3·8
34	4 ,, ...	7,149	3·8	271						3·9
35	5 ,, ...	7,401	3·7	273	310	·20	·80	13·4	6·0	3·85
36	6 ,, ...	7,602	3·7	281	611	·20	1·10	26·3	8·8	3·8
37	7 ,, ...	6,857	3·7	253						3·8
38	4 March ...	12,368	3·7	457	552	·20	·20	22·6	1·4	3·8
39	5 ,, ...	11,949	3·8	454	545	·25	·30	27·4	2·2	3·9
40	6 ,, ...	11,982	3·7	443	516	·20	·20	22·0	1·5	3·85
41	7 ,, ...	10,652	3·9	415	494	·20	·20	19·4	1·4	4·0
42	8 ,, ...	11,429	3·9	445	521	·20	·20	20·9	1·5	3·9
43	9 ,, ...	11,787	3·8	447	544	·20	·20	21·6	1·6	3·85
44	3 April	4,505	4·4	198	230	·30	·30	12·0	1·0	4·6
45	6 ,, ...	4,335	4·5	195	231	·35	·30	13·4	1·0	4·7
46	13 June	4,596	4·3	197	232	·15	·60	6·3	1·5	4·4
47	18 ,, ...	6,427	4·3	276	318	·15	·60	8·8	2·3	4·4

MILK TESTS—*continued.*

No. of Tests.	Date.	Milk, in lbs.	Butter-fat in whole milk, by Babcock machinery.	Total butter-fat, as calculated from two previous columns.	Commercial butter made.	Percentage of butter-fat in separated milk, per Gerber method.	Percentage of butter-fat in butter-milk, per Gerber method.	Total actual loss in separated milk.	Total actual loss in butter-milk.	Butter-fat per cent. in whole milk, by Gerber method.
	1900.							lbs.	lbs.	
48	30 June	10,756	3·9	419	493	·10	·30	10·0	4·2	3·9
49	2 July	12,246	3·8	465	536	·15	·40	16·7	6·4	3·8
50	11 Aug.	8,742	3·65	319	357	·15	·30	11·8	1·0	3·75
51	12 & 13 Aug.	17,086	3·7	632	714	·15	·30	23·1	2·2	3·8
52	19 Aug.	4,317	3·65	157	430	·25	·40	22·6	2·8	3·7
53	20 ,, ...	5,538	3·7	204						3·8
54	23 ,, ...	22,142	3·8	841	955	·15	·40	29·8	8·0	3·8
55	25 ,, ...	11,891	3·9	463	526	·15	·20	15·9	2·0	3·9
56	27 ,, ...	7,001	4·0	280	324	·10	2·6	6·3	11·7	4·2
57	28 ,, ...	7,136	4·0	285	335	·10	1·9	6·4	13·0	4·1
58	29 ,, ...	10,769	3·8	409	468	·10	1·5	9·7	15·0	4·0
		789,811	...	29,878	33,965	...	...	1,468·5	415·9	...

Calculating from these tables, we find that the milk supplied averaged slightly over 3·78 per cent. of butter-fat as tested by the Babcock machines in the various factories. The milk, as tested by the Gerber process, which was in some instances checked by gravimetric analyses, averaged nearly ·1 of 1 per cent. more than by the Babcock, thus showing that the milk supplied averaged 3·88 per cent. of butter-fat. The loss in separated-milk and butter-milk was unduly great in some cases, and this brought the average loss rather high, ·23 of 1 per cent. being lost for every 3·88 lb. of butter-fat supplied, as already stated. The loss usually allowed in arranging charts has been ·22 of 1 per cent. After deducting the total amount of butter-fat that passed away in the separated-milk and butter-milk from the gross total amount of butter-fat supplied, as calculated by the Gerber process, we find that the amount of butter-fat thus left for butter-making, when compared with the total amount of commercial butter made, bears the proportion of 84·8 to 100, thus going to show that 84·8 per cent. of the entire butter was pure butter-fat. This would mean that there were 15·2 lb. of matter other than butter-fat (water, salt, preservative, casein, &c.) present in every 100 lb. of commercial butter.

This comes marvellously close to the basis of the charts referred to, so that, everything else being right, the total amount of butter, as calculated on chart lines, should be very close to the actual churn results. Looking at above tables, we see that the actual churn output was 33,965 lb. Now let us take the amount of milk, viz., 789,811 lb., testing on the average 3·783 per Babcock; and, calculating from this on the chart lines given, we would get a total amount of commercial butter of 33,107 lb., the churn thus showing a gain of 2½ per cent. over the calculated results.

On the other hand, if we use the slightly higher average test, viz., 3·88 shown by the Gerber method, and then calculate as before, we get 34,008 lb., or ·1 of 1 per cent. too much.

It might be asked what inferences are to be drawn from these tests—should the Gerber method supersede the Babcock in our factories? I do not think so. These tests were carried out with various styles and conditions of Babcock machines found in the different factories visited, as against the one Gerber, which was in perfect order; and where, in one or two instances, a steam Babcock was used, the difference between the results from it and the Gerber was practically inappreciable. With a steam turbine Babcock the heat is well maintained throughout the operation, the speed is also greater and more regular than in the ordinary Babcock, and finally, when it comes to reading off a number of tests, the temperature is easily maintained by the heat of the machine, and thus no shrinkage takes place in the fat column.

It must also be borne in mind that these figures represent the actual amount of butter as weighed without making any allowance for packing. When making butter for export, this packing or shrinkage allowance runs from 1 to 1½ per cent., so that the actual factory gain would be but from 1 to 1½ per cent. Also, these tests were owing to convenience made at factories where the cream was churned where separated, or where the carting distance was very small, so that the waste of cream in these experiments was below the average in factory work. Again, although some bad results in churning and separating are shown (the bad churn results were due to ineffective cream cooling arrangements), it will be generally admitted that more attention than usual is given to these points when it is known that the separated and butter milks are to be analysed. Working on the results of the Gerber method, and using the chart referred to, it can be seen from these tables that the factories, unless they did better work in separating and churning, would just lose about the amount lost in packing, viz., 1 per cent. There is, however, no reason why better work should not generally be done. Separators are much improved since the allowance of ·22 of 1 per cent. was made a basis as loss in separating and churning, and the best factories can now reduce this to about ·17 of 1 per cent.; so that a machine (say, steam Babcock) giving *equally high readings with the Gerber could be used with the present chart* by the best factories and still make ends meet.

In almost all cases the water in these butters was carefully determined by gravimetric analysis.

The Distribution of Fruit.

W. H. CLARKE.

MANY orchardists who spare no effort to raise fruit of the highest quality complain that they do not get an adequate return for the labour and expense involved in growing, packing, and marketing such produce; and a large number of people who regard a liberal allowance of fresh fruit as an indispensable part of their diet complain incessantly of prohibitive prices and the great trouble experienced in securing sufficient supplies of fruit that is quite fresh.

All sorts of reasons are given for the state of affairs. The fact remains that despite the more general adoption of improved methods of production, the regulation of imported fruit, the existence of a market and agencies controlled by men who have in nearly every instance spent a lifetime in the trade, and of innumerable shops in which large stocks of fruit are piled in picturesque heaps, not to mention greengrocers, Chinese, and itinerant dealers, the distribution of fruit among the people who are only too willing to pay prices commensurate with quality is not on a satisfactory footing. Although a good many people do not appear to think so, fruit is just as perishable as milk or bread or meat; and what inconvenience would arise if housekeepers had to obtain each of those commodities in the same way and condition as they at present secure fruit. Why cannot the fruit trade be handled somewhat after the same manner as the dairy, bakery, or butchery business? The supplies comprised within those industries are produced to a great extent under the same varying conditions of climate and season as fruit; but their prices, although they may rise or fall occasionally, are not subject to the spasmodic convulsions that we find in the fruit trade. There may be a reason—but it is certainly an obscure one—why a householder who wishes to have fruit regularly on his table cannot procure it as it comes into season with the same facility and at the same reasonably uniform rates as other articles of food.

Would it not be possible to establish co-operative or proprietary fruit-distributing depôts? From a commercial point of view there is surely as much money in handling fruit as there is in handling milk; and there does not appear to be the slightest doubt that if fruit depôts were established, and a businesslike effort were made on the part of the management to meet the requirements of customers, thousands of families consuming from 3s. to 5s. worth of fruit per week would avail of the opportunity of a reliable delivery of it, sound and fresh. Moreover, with the ease and surety of obtaining it, the demand for fruit would grow, to the great advantage of all concerned.

The equipment of a fruit-distributing depôt need not be elaborate. There would be required a well-ventilated roomy store alongside the railway-line or so close to it that carriage of the cases from the truck to the store would not be anything more than an infinitesimal charge. Each case of fruit, on arrival, could be emptied out on a table, to be sorted into two grades—the first quality for people who are willing to pay the value of it, and second quality for customers who wish for that class for culinary purposes. Any fruit blemished or unsound, with all misshapen, undersized, immature, or over-ripe fruit, could best be disposed of by replacing in the sender's cases and returning it to him at his own cost. The great aim should be quick despatch and delivery, so that customers may have the fruit within as few hours as possible from the time it is picked in the orchard. It could be delivered in boxes or trays, according to orders, the carts picking up the empties and obtaining orders as they leave the filled packages.

Any expression of opinion as to whether better results could be achieved by the running of such a concern as a proprietary or upon co-operative lines is, perhaps, going beyond the scope of the writer. The aim of the *Gazette* is to endeavour to bring under the notice of orchardists the best means of raising good fruit, and to suggest means of disposing of it advantageously to themselves and to the general public. The rest can, no doubt, be safely left to those concerned in the industry. But even if the mode of distribution indicated here is somewhat wider in its scope than the systems adopted by Colonial, American, and European fruit companies, the fact that, at an outlay of at most £2,000, the inauguration of it could be effected and continued for a period sufficiently long to form some estimate of its adaptability, may commend the plan to the consideration of those who desire to see the fruit industry prosper as it should.

HANDLING AND STORING LEMONS.

FOR the lemons that can be kept in good condition until the summer is well advanced, there is always a good market. It is true that at that particular time imported lemons are very much in evidence, but there is no particular reason why our local fruit should not also be available. The most important adjunct to a lemon orchard is a curing-house, and the provision of an inexpensive building for the purpose is about as good an investment as can be made.

In some districts, where the shelter is adequate, lemons can be left on the trees for a long time, and there is no doubt that in this way they undergo, to an extent, the curing that does so much to enhance their value. But even if leaving the fruit hang on the trees till the rise of market were the best system in the world, it is attended with considerable risk. When a case of lemons is worth 15s. or 18s., the fruit-thief will dare a great deal, and an orchardist can usually find something more pleasant to look at in the mornings than row after row of robbed trees.

Mr. Scott Way, a successful Californian lemon-grower, has brought under the notice of the Southern Californian Fruit Exchange details of a method of handling and curing lemons which that body recommend to the lemon-growers of the State. Mr. Scott says, "My lemon house is an inexpensive one, 18ft. x 36ft., and 10 ft. high to ceiling. It has only a 4-inch space between the outer and inner walls, and no way of ventilating this space. Between the ceiling and roof, however, there is an air-space with ventilator always open at each gable, and two openings, 2ft. x 3ft. each, in ceiling. These are rarely closed. A large door at each end of the house is kept open at night and during cloudy days, but closed whenever there is sunshine. Unlike other lemon houses in this colony, my house is set on piers and has a free circulation of air beneath the floor. I think that this will be a great advantage during wet weather. It is not a very cool house. During hot days the mercury sometimes reaches 90 degrees, but it cools very quickly when the doors are thrown open at sundown. During the three years I have held winter lemons, I have had very little decay and no wilted fruit whatever. I pick in the ordinary picking-box, with a slat at each end, and pile them six or seven high in the lemon house, allowing them to remain thus about two or three weeks for fall or winter-cut lemons. I then transfer carefully to boxes without slats, putting a sheet of newspaper between each layer, and a double sheet on top. All long stems are cut close before this transfer. The boxes are again stacked, six or seven high, and a sheet of canvas thrown over the pile. My fruit is not again disturbed until it is gone over preparatory to taking over to the packing house."

Taking a lesson from Mr. Way's book, it would be simple enough to calculate how large a building would be required to accommodate the crop from a given acreage, and make provision accordingly. Between £50 and £60 would cover the cost of a building of the dimensions indicated, and of a very substantial character. In a good many districts it could be availed of for storing oranges until the glut passed, and be emptied in ample time to receive the lemon crop.

It is quite possible that much of the success of Mr. Way's style of curing-house is due to its erection on piles. Citrus fruit, when stacked away in cases, gives off carbonic acid gas. This being heavier than the atmosphere is only removed with difficulty from a storeroom flush with the ground, but is readily carried away when a current of air can pass beneath the floor on which the fruit is stacked.

The precautions against the admission of sunlight are also worth observing. Mr. Way places great stress on the necessity of picking lemons at the proper time. He never picks immediately after rain or high winds. The boxes are kept in the shade as picking proceeds, and are covered by an empty box until the end or cooler part of the day, when they are removed to the curing-house in a vehicle with easy springs, and covered over carefully with canvas. The picked fruit is on no account exposed to the sun.

Bee Calendar.

ALBERT GALE.

DECEMBER.

We are now entering upon the most profitable season of the year as it regards the honey harvest. Swarming should now be over in every part of the Colony. Of course, there will still be a few swarms coming out, such as cast maiden swarms, &c.; but these should be returned to the parent stock. Where honey-producing flora is abundant, extracting can be carried out almost to any extent for the next six or eight weeks. Even the frames in the brood-chamber, where there is only a little sealed brood, may be taken out and extracted; but there is not much profit in so doing, especially if the flow should cease a little earlier than might be expected. The two outer frames, the external ones on either side, have seldom brood in them, unless the queen be exceptionally good, and if there is honey in sufficient quantity in the other frames for winter, these may be safely extracted and returned to their places. It is only when there is plenty of honey coming in that it pays to extract from the brood-chamber.

In uncapping, cut downwards, and hold the frame so that the cappings may fall clear of the comb. By so doing it will save a lot of time, and time is money. Be careful in placing the uncapped combs in the extractor. The frame must be placed so that the bottom bar, when the extractor is set in motion, should lead. The reason of so doing is that the cells have a dip; by cutting a piece of comb through the angle of the dip will be plainly seen. If the bottom bar be placed as advised, the centrifugal rotary motion of the machine draws the honey out of the cells. Do not extract unless fully two-thirds of the cells are sealed, otherwise the honey will have a tendency to ferment, owing to its being unripe. The riper the honey—that is, the more perfectly sealed the honey-cells are, the less the tendency to fermentation. If honey is in any way watery when in bulk, let it remain open in some warm position, secured against ants and robber bees. The evaporation will aid in its ripening and give density.

Supply the bees with plenty of water. A vessel with bits of cork or other floating material thrown in, and placed in easy access to the bees, is a very useful thing in an apiary. It saves time for the bees by preventing them going off to the creeks. One or two tins containing brackish water are also very useful. Bees are passionately fond of salt, as will be seen by the eager way they search the ground where the liquor from corned beef has been thrown out, pig-styes, the margins of brackish creeks, &c.

Supersede all degenerating queens.

Farm Notes.

NORTHERN RIVERS DISTRICT.—December.

H. V. JACKSON.

The three months ending 31 October, 1900, proved to be exceptionally trying, and plant-life suffered accordingly.

On 8	August	... heavy frost.
20	„	... light frost.
21	„	... heavy frost.
22	„	... medium frost.
28	„	... „

The rainfall was :—

1	August	... 31	points.
2	„	... 1	„
4	„	... 1	„
13	„	... 3	„
15	„	... 27	„
27	„	... 2	„
31	„	... 2	„
Total ...		... 67	

1	September	... 1	points.
2	„	... 3	„
8	„	... 8	„
11	„	... 1	„
12	„	... 30	„
16	„	... 13	„
17	„	...147	„
18	„	...109	„
19	„	... 2	„
20	„	... 1	„
21	„	... 1	„
22	„	... 1	„
24	„	... 9	„
25	„	... 5	„
26	„	... 2	„
	Total	...333	„

Strong westerly winds during fine weather.

10	October	... 1	„
22	„	... 14	„
	Total	... 15	„

Westerly winds.

High drying westerly winds prevailed, thereby rapidly drying up the moisture from the light showers that did fall. In November there was a welcome break in the weather, and from the 4th to the 10th of the month 219 points of rain fell, enabling farmers who were behind in their maize-sowing to commence operations, in the hope that more rain would follow.

In somewhat stony land the crops of pumpkins and of maize made better growth than did similar plants in other situations during this dry time. Potatoes suffered considerably from the attacks of insects, and promising beds of onions were checked.

Maize, pumpkins, grammas, sweet potatoes, and hay are the principal summer crops, and with the likelihood of more favourable weather everything should be taken in hand promptly. To obtain good returns, especially in land that has been constantly cropped, do not be afraid of some little outlay for manure, and plough deeply and thoroughly, and keep the growing crops free from weeds.

Sweet potatoes are not planted so extensively as they might be; this is, perhaps, in consequence of the little extra trouble there may be to raise the plants in the first instance, but the yield of tubers will be found very satisfactory.

The sweet potato may be grown either on the ridge system or on the flat; in well-worked, deep soil they do very well grown on the flat, in rows 3 ft. 6 in. apart, and about 20 inches apart in the rows. The land between the rows should be worked with the cultivator to keep down weeds and keep the soil in good tilth, and as the vines begin to meet between the rows they should be checked from rooting if good-sized tubers are desired; if the vines root over much as they run, the formation of numerous tubers between the rows will be detrimental to the formation of large tubers in the rows proper. Manures most suitable are those containing sulphate of potash.

The best vegetable to grow at the present time is the French bean, but it will need moisture, and will not make satisfactory progress if the soil is very dry.

Plough land for turnips, potatoes, &c.

Sow sorghum, amber cane, and maize for green fodder or for making ensilage.

Broom millet crops, sown some little while back, will probably require thinning out, and the land between the rows cultivated. Sowings may still be made.

If moist weather prevails, now is a good time to sow seed of *Paspalum dilatatum* grass, and it is also a good time to plant out roots of this grass.

Roots of guinea grass may also be planted, but it is not advisable to attempt growing guinea grass where severe frosts are experienced.

Pineapples and bananas may be planted, and ground should be ready to plant out coffee seedling trees if seasonable rains prevail.

If the weather is favourable, or if water has been available, rhubarb should be plentiful.

Plough up all vacant plots of land as soon as the crops are off.

Look to fruit trees and vines for insect and scale pests.

RIVERINA DISTRICT—DECEMBER.

G. M. McKEOWN.

Maize

MAY still be sown for ensilage or green fodder where it can be irrigated.

The best soil for the production of this crop will be found in the black soils of our river-flats.

Deep ploughing is essential, and the soil should be brought into a fine tilth by means of harrowing.

An excellent implement for the purpose will be found in the double-spading harrow.

Seed should for all purposes be sown in drills at 3 to 4 feet apart.

All growing crops should be frequently scarified lightly with the horse-hoe; and in these dry districts the plants should not be hilled, as the operation of hilling seriously injures the roots, and makes cultivation of the crop during its growth very difficult.

Sorghum

Should be sown without delay in well-prepared land, preferably river flats, in situations sheltered from hot winds, where irrigation is practicable only.

Seed should be sown in drills about 3 feet apart, allowing 8 lb. to 10 lb. seed per acre.

The best varieties, so far, have proved to be amber cane and planter's friend.

All growing crops should be well tilled with horse-hoe.

Millet

May still be sown, provided fair showers fall during the month.

The Hungarian and Japanese varieties will give the best results.

Seed should be sown at 12 to 15 lb. per acre, in finely-prepared land, and lightly covered with a light lever harrow.

The crop should be cut for hay before the seed forms.

Pumpkins and Melons.

The soil round the roots should be well mulched, and, where possible, supplied with water.

Where cultivated on a larger scale, keep the harrow or horse-hoe going between the rows as long as the size of the vines will admit.

Pinch off the ends of vines to promote a greater lateral growth, thus ensuring greater bearing capacity, and at the same time shading the roots of the vines from the prevailing heat.

Air-slaked lime or wood ashes dusted on the vines will prove an effectual remedy for beetles, &c.

Tomatoes.

Mulch and water as liberally as possible. All plants should be tied to stakes. The single-stem system, provided the upward growth is kept in check, and a liberal lateral growth is promoted, gives good results; but the most satisfactory method will be found in the use of three stakes to each plant. The stakes should be sloped well outward from the plants, of which three main branches should be trained, one on each stake. By this system ample protection from the sun is afforded the main stem and roots, and crowding of the fruit among the foliage is prevented. The liability to fungous diseases is also decreased should the season prove moist.

HAWKESBURY DISTRICT—DECEMBER.

GEO. VALDER.

Maize.

SOWING has been considerably delayed by the continued dry weather. Numbers of farmers, however, intend to still sow large areas should the drought break up soon, and there is, therefore, every prospect of a big demand for seed of the quick-maturing varieties. Great interest has been taken in the introduction of the quick-maturing varieties from America, and some few farmers who have seed intend to try the experiment of sowing after the potato crop is dug, which will be in January. In favourable seasons they maintain that the quick-maturing varieties would do well if sown as late as this, and the fact of their being able to sow after the potato crop comes off is a most important point. Also, it has been noticed that several of these quick-maturing varieties produce heavy crops of foliage, and, therefore, even should they fail to ripen their grain, the crop would be useful for late feed for ensilage.

Table Maize.

This splendid vegetable is still much neglected, and yet in our principal maize districts it should be one of our chief summer vegetables. The Sydney seedsmen offer seed of several first-class varieties. It requires the same cultivation as ordinary maize, and there is little difficulty in growing it. To be of the best quality, however, it requires to be quickly grown, and therefore it is best to select a fairly rich piece of soil and cultivate thoroughly. Small crops of table maize grown in the neighbourhood of Sydney have proved very remunerative, and I have no doubt that if there was a good supply the demand would rapidly increase.

Sorghum

Can still be sown largely for green fodder or for ensilage. It is also a crop which often pays well if grown for its seed. There is generally a ready sale for it at remunerative prices; and if the market is low the seed can be used for feeding to stock. It is very similar to shelled maize, but contains less protein and more fibre. It is best fed when ground and mixed with oats or peas. The question of utilising sorghum for the production of sugar is still receiving considerable attention in the United States. By careful selection the sugar content of some of the varieties has been raised from 9 to 14 per cent. The stalks after the seed has been removed can also be utilised for feed, giving the best results if chaffed or shredded and made into ensilage.

Broom Corn or Broom Millet.

The early crops should be carefully cultivated and thinned out. Thinning is very necessary, as on it depends to a great extent the even character of the broom; at the same time the plants must not be thinned too much or the broom will be too coarse. Sowings can still be made, the late crops often producing high-class brooms. Last year several complaints were received of the heads being smutted. This smut should be treated in the same way as the smut of oats or wheat—*i.e.*, by treating the seed either with hot water or blue-stone. Also, it is advisable to select only healthy plants for seed. It pays well to set aside a small portion of the crop, cull out the inferior and diseased plants, and allow the remainder to thoroughly ripen their seeds. By this means a superior class of broom can be obtained, the plants being more even and producing a more even class of broom.

Millet

Can still be sown for green fodder and for hay. There is a small sale for millet seed for feeding to birds, &c., the principal variety being White French. This variety grows well in many parts of the Colony, and as it is a very heavy cropper, a few acres could often be profitably grown for seed.

Root Crops.

Land should be ploughed this month for turnips, potatoes, &c. It is a great advantage to have the land turned up early, and exposed for some few weeks before sowing. Turnips generally succeed well in this district, and even if the market is too low, they are always useful on the farm for feeding to all kinds of stock.

Rape, Kales, and Mustard.

Land should also be ploughed for these crops. In a fair season they will prove exceedingly valuable forage crops, and if fed off with sheep will often greatly improve the land. For quick-growing crops, Mustard and Dwarf Essex Rape are the best, and for late crop both Thousand-headed Kale and Jersey-tree Kale are valuable. The first sowings should be made next month.

Leguminous Crops.

If sown for green manuring should be ploughed under or fed off early this month, in order to prepare land for potatoes, turnips, &c. If fed off with pigs, the land is left in splendid condition for these crops. Cow peas can still be sown for green fodder, ensilage, and for seed.

Wheat.

The crops have now been harvested, and, from the reports received regarding the wheat grown in this district, it is plainly seen that the early varieties again gave by far the best results. Also, the early sown crops were far superior to the late sown ones. In fact, in many instances the late sown crops were a complete failure. Some splendid samples of hay were obtained from the early sown crops, and in many instances the yield considerably exceeded three tons to the acre. At the College farm, "White Lammas" and "Medeah" gave about the best yield of hay; and for grain, "Allora Spring," "Steinwedel," and the two former did best.

Orchard Notes.

W. J. ALLEN.

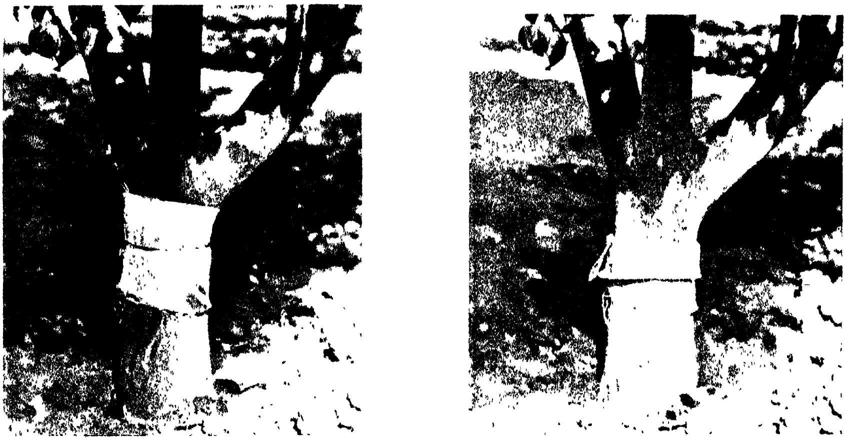
DECEMBER.

THOSE growers who are producing large quantities of apricots will be very busy this month, picking, packing, jam-making, pulping, and drying this fruit. Although in many places the crops are much lighter than last year, the quality of the fruit will be far superior. For those who are going in for pulping their fruit I would recommend the use of the 10-lb. tins if the pulp is intended for export, and care must be observed not to overcook the fruit, as the London market does not want fruit boiled to a mash; on the contrary, buyers require the fruit as nearly as possible in its natural shape—that is, after the fruit has been cut in halves and the pit removed.

Wherever this fruit is grown and the jam or canned fruit used, the housewife should put up a sufficient quantity for household use. In the *Agricultural Gazette* for December, 1899, I gave particulars of the canning process, and I think every person has a knowledge of jam making; but in case there are a few who have not tried this process, I give the following simple recipe:—Wash the fruit, and after halving it remove the pit and weigh before placing it in an enamel preserving pan with just sufficient water in the bottom to prevent the fruit from burning. Cook for half an hour and then add the sugar, using three-quarters of a pound of the latter for each pound of the fruit. Cook slowly for two hours—then bottle and seal down when cold.

Cultivation and irrigation will both require careful attention this month. Wherever this latter is not practised, the cultivation must be done thoroughly, and should rain fall in any of the fruit-growing districts, the cultivator should be run over the land as soon as possible afterwards, thus preventing the land from caking and preventing excessive evaporation.

One of the best two-horse riding cultivators is the Planet Junr. Riding Harrow and Cultivator, which does exceptionally good work, in many soils proving superior to the Top Notch, and for the orchardist who has more than 10 acres under cultivation and keeps a couple of horses one of these implements is almost indispensable, as one man a boy and a team will easily cover twice as much ground as a one-horse cultivator. I cannot understand why there are not more of the cultivators in use as their advent into the larger orchards would be the means of saving the fruit-growers of New South Wales many hundreds of pounds per annum. There is also a cultivator, commonly known as the Chisel Tooth, which is extensively used in California, which stirs the ground up well without turning it up. These have to be guided and held in



I.

II.

PROPER WAY TO BANDAGE TO CATCH CODLIN MOTH GRUBS.

(No. I shows the proper way to bandage an apple-tree.)

IT will be seen that the hessian is doubled, the cut parts or ends pointing downwards, and the cord or wire which may be used is then tied around the centre, after which the part above the cord is turned down as is shown in Fig. No. II. The grubs on ascending the trunk of the tree hide in these bandages, and when these are tied with cord large numbers of grubs find their way to it and spin their cocoons there position with a pair of handles, and must be handled with care. The chain harness and rope rein so much in use in many of the orchards should be discarded and leather ones substituted in their place. For a single horse the rope reins do not matter so much, but in guiding the horses through an orchard the check reins keep the horses better in hand, and the chain harness wherever it touches a tree or limb is sure to take some bark off. I would therefore recommend for orchard work (when two horses are used) the leather reins with checks and leather harness in every case, and wherever it is necessary to use handles for guiding either cultivator or plough, the driver will find it greatly to his advantage to have the reins long enough so that they can be carried around to his back, so that by leaning back a little he can keep his horses working evenly and guide them, and thus leave the hands free to guide the implement. In California were a man to enter an orchard with a team of horses with chain harness and rope reins he would not be allowed to remain there for five minutes. The same applies to Mildura in Victoria and Renmark in South Australia, where the chain harness and rope reins are considered one of the relics of the old days.

The uniform fruit case is a matter which should be taken up by our different Progress Committees and Horticultural Societies, so that when a price is quoted, per case or half case of fruit, the public would have a fair idea of what was being sold, or the quantity of fruit which the purchaser was buying.

To those who are supplying the fresh fruit market, I would again sound a note of warning as to the care to be observed in the picking, grading, and packing of the fruit. Do not allow the fruit to become too ripe before picking, or else it will have to be sold immediately on arrival in Sydney at whatever price it will bring. As a large portion of the fruit shipped to Sydney finds its way into the back country, it will be seen that it must reach here in good firm condition to compete for trade.

The scale on citrus trees will require attention, as the larvæ will be moving about this time, and are more easily destroyed at this stage.

Do not neglect the codlin moth, but inspect the bandages every ten days, and I would urge on those who grow apples, pears, and quinces the necessity for united action, as if a few in any district are neglecting to fight this pest, they will breed enough to supply their neighbours with moth from year to year, and I consider our only chance of getting rid of this pest is to co-operate for its destruction. I feel sure that we can get rid of the San Jose scale with a little care, and infinitely less expense and labour than the codlin moth in this Colony.

Fruit-drying will commence the early part of the month wherever suitable varieties are being grown. See that the fruit is cleanly cut and properly fumigated, and observe the greatest care in placing it where it is not likely to become dusty or dirty, and do not allow it to become hard before taking it off the trays, but remove it in the heat of the day while it is quite pliable, and put the dried fruit into calico bags to keep it away from the ravages of moths. The pits taken from apricots and peaches make very good fuel. In California large quantities of apricot pits are sold for the manufacture of Prussic acid, and from the seeds of the raisin and wine grapes an oil is made, and from the winery refuse, Cream of Tartar.

The apple crop of the United States is estimated at 40,000,000 barrels as against 37,000,000 last year. There are about 3 bushels to the barrel. This is only a very average crop, consequently there should be a good market in the Old Country for Australian apples this coming season.

It may not be generally known to pastoralists and fruit-growers that a little cinnamon bark, steeped and added to the water used for mixing pollard and phosphorus for poisoning rabbits, makes the mixture more palatable, and they will leave good green feed to feast on this. In this way they can be poisoned in the winter and spring when green feed is plentiful, which, under ordinary conditions, is .the hardest time to get them to take any kind of poison.

In tropical parts of the Colony pine-apples may be planted, if moist weather prevails. Suckers are the best to plant, being much the stronger and the earliest to arrive at maturity. Being a great feeder, a dressing of strong nitrogenous fertiliser will promote rapid growth and fine fruit. While the plants are young, cultivation must be thorough, but not deep enough to cut the feeding roots which are near the surface.

Bananas and other tropical fruits may also be planted during the rainy season.

HIGH PRICES FOR CHOICE FRUIT.

THE Pomologist of the United States Department of Agriculture, while visiting the Paris Exhibition, attended some fruit sales.

The sales are held in an auction room, the producers, who have organised a strong central syndicate, being represented by the secretary of their organisation, who reports to them upon the condition and quality of their fruit, as well as the prices obtained. Strawberries, nectarines, and peaches (in the month of May), brought prices that fruit.growers in this part of the world can only dream about. For instance, two dozen Lord Napier nectarines brought 29 francs, about 25s., and a dozen Alexander peaches, within a fraction of 30s. All of the fruit was bought by dealers, the largest retail houses in the capital being represented by bidders.

It was particularly noticed that while buyers exhibited little hesitation in bidding high for the choicest fruit, they refused to bid at all for that of inferior quality; and the same applied to every branch of the produce trade.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF DECEMBER.

Vegetables.

AFTER the soaking rains we had last month it will take the gardener all his time to keep down weeds. For the hot, dry weather almost certain to prevail during this month it is wise to conserve the soil-moisture by the destruction of weeds as soon as they appear above ground and by keeping the surface, to a depth of at least 2 or 3 inches, thoroughly pulverised and stirred. Care should be taken not to apply much raw manure to the vegetable plots during summer unless there is an abundant water-supply, and it is well to remember that although a sprinkling from a watering-pot may appear to nicely damp the surface, the application of a few gallons to a large bed does very little good. Indeed, the only effect it has, unless the sprinkling be followed every now and then by cultivation, is to bake the soil and dry it out. Much better results can be obtained by giving the land an occasional soaking, and then preventing the loss of moisture by incessant cultivation or a good thickness of litter mulch.

Seedlings transplanted should be sheltered until they become established in their new home, and for the purpose it is difficult to find anything handier than tea-tree brush.

The secret of successful production of vegetables in summer lies in confining one's operations to only such an area as can be paid constant attention, and for which ample supplies of water are available at the critical times.

Beans, French or Kidney.—As soon as old plants have ceased to produce beans they should be cleared away, and the ground can then be used for some other kind of vegetable after it has been well dug up and manured. The beans should be picked before they are nearly full grown, and then plants will continue to bear several crops. If any beans are allowed to ripen, the plants will cease to bear and will gradually die away. Seed should be sown to keep up a supply of this vegetable. If the soil is dry the bean seeds should be soaked with water after they have been sown in the rows and before the soil is covered over them. It would be advisable to spread a mulch or covering of horse or cow dung over the rows when the seeds have been sown and covered with soil. When the seedlings appear well above the ground sow a few more rows and so on. The French bean is one of the best and most reliable of vegetables for the summer, and should, therefore, be sown largely as suggested, so that a constant supply may be kept going. The tall-growing varieties may be sown, if preferred, but then more labour will be required in consequence of sticks or supports being necessary for the plants to climb over. But at the same time it is possible to keep the plants somewhat dwarf by cutting them back.

Brocoli.—This plant is almost the same as the cauliflower, and is well worth growing. A small quantity of seed may be sown, either in boxes or a seed-bed, which should be shaded and watered. When the plants are strong and hardy they should be planted out, about 3 or 4 inches apart, in a small, well-prepared bed, in order that they may develop well for further planting out in their permanent places.

Borecole or Kale.—Sow a little seed, and shade and water as suggested for brocoli.

Cabbage.—Sow a small quantity of seed and treat as above. Strong young seedlings may be planted out to some well-prepared ground. The richer the soil the wider apart they may be planted—say from 2 feet 6 inches to 3 feet. It may be advisable to give cabbages frequent applications of liquid manure during this time of year, for they should be kept growing vigorously, and they are better able then, amongst other advantages, to withstand the attacks of aphis and caterpillars, which often destroy whole crops during the summer.

Cauliflower.—Sow a small quantity of seed and treat them as recommended for brocoli.

Cucumber.—Seed may be sown if more plants are required. The fruit should now be available in quantity. Plants coming on slowly will be improved considerably if supplied with occasional applications of liquid manure, made from horse, cow, or fowl dung, or all three mixed together. It should not be allowed to flow over the leaves when applied.

Celery.—A little seed may be sown during the month so as to have a supply available if required. There is no need to waste seed, for not many plants will be required. Celery is not only a wholesome useful vegetable for salads, but is excellent when boiled. A few plants should be put out occasionally from the seed-bed to ground that has been heavily manured. A few well-grown plants may be earthed up to blanch their stems as required. The application of liquid manure occasionally will be of advantage.

Cress and Mustard.—Sow a little seed occasionally to keep up a supply. Make the ground rich with well-rotted manure.

Egg Plant.—A little seed may be sown, if plants are required.

Maize, Sugar or Sweet.—This is now beginning to be used in the Colony as a vegetable, and it is well deserving of a trial. The ordinary kinds of maize are not nearly so good for table use as the Sweet varieties, seed can be obtained at any of the leading seed warehouses and the plants will thrive in any well-prepared soil in sunny situations.

Onion.—Sow a small quantity of seed in drills. Attend carefully to growing plants, and keep them quite free from weeds.

Parsley.—If there are no plants in the garden sow a little seed, for no garden should be without a few plants.

Peas.—In the cool parts of the Colony sow a few peas, and keep the ground between the rows well cultivated, in order to retain moisture and destroy weeds.

Pumpkin.—Seed may be sown if more plants are needed, or if the supply from plants already raised does not seem likely to be sufficient for requirements

Radish.—A little seed may be sown occasionally to keep up a supply.

Spinach.—Sow a little seed of this useful vegetable, which is not grown so frequently as it should be.

Tomato.—There should be an abundance of fruit in all kitchen gardens at this season of the year. A great deal is generally wasted and allowed to rot, when it could be preserved and made into sauces and so on. Seed may be sown if any more plants are required.

Turnips.—Sow a small quantity of seed in drills, and thin out the plants well when they come up.

Flowers.

A GOOD deal of attention must be given to Chrysanthemums if it be the intention to grow flowers of the best quality. Chrysanthemums will grow almost anywhere, provided they have sufficient moisture, and will produce pretty flowers in great quantity; but it is quite a different matter if extra fine flowers are required. Considerable care must be taken with the plants from their youngest stage until their flowers are in full bloom. They will need watering frequently overhead and to the roots. They should be grown to one stem only, and they should be tied up to a trellis, or to stakes, as they grow. Liquid manure, in a weak state, should be supplied occasionally, and a dressing of farmyard manure—straw and dung—had better be spread over the soil between the plants as a mulch. All suckers should be removed as they grow up around the plants, and insects, caterpillars, &c., must be looked for almost daily. Enthusiasts in Chrysanthemum culture take a great deal of trouble with their plants, much more than is generally supposed. Very good flowers may be grown under ordinary care, however, and they are worth spending some little time over. Chrysanthemums make very pretty pot-plants, for they can easily be trained into a variety of forms, with little more trouble than nipping off the shoots and tying out the branches as they grow.

Dahlias will need good supplies of water, and some liquid manure now and then. They should be tied up in stakes as they grow, for they will need support, their stems being very brittle and easily broken by winds.

Bouvardias, which bear exceedingly pretty and graceful flowers, should now be producing abundantly, and the more frequently the flowers are cut the more the plants will produce. They should be supplied with liquid manure occasionally, if they do not seem to thrive luxuriantly.

Remove the dead leaves of bulbs as they dry up, but do not cut them off whilst they are in a green state. It would be as well to put in two or three sticks around the bulbs, to prevent them being destroyed when digging up the garden.

General Notes.

FERTILISERS AT THE PARIS EXHIBITION.

WITH regard to both the French and foreign sections, the agricultural part of the Exhibition demonstrates clearly the progress realised by a judicious use of fertilisers. Here we find the researches and experiments undertaken by the agricultural stations and laboratories, with their actual results, as well as documents showing the increasing use of the fertilisers exhibited by the various syndicates. Whichever way we turn, we find the same conclusion to be drawn—the progressive development and general use of fertilisers, with, at the same time, the advantages to the agriculturist derived from their use. This is specially accentuated in the French section, which is natural, as it is only during the last fifteen years that this advancement has been realised in France. The Exhibition of 1889 showed the first manifestations of it; the present one amplifies it in a wonderful manner.

The manufacturers of fertilisers have organised splendid exhibits as counterparts of the agricultural exhibits, and their examination leads to the same conclusion. They both illustrate, under most interesting and varied forms, the development of the industry, which really is exceptionally remarkable. The same may be said of the mines producing nitrate of soda, those producing natural phosphates, the manufacture of super-phosphates and dephosphorising slag, which to the metallurgical works has become of such vast importance as could never have been foreseen a quarter of a century ago; but it is, perhaps, as showing the use of potash fertilisers that these exhibits give particular evidence. The mines and works of Stassfurt, in Germany, have almost the monopoly of supplying potash fertilisers, not only to the agriculturists of Europe, but also to those in other parts of the world. The production has been doubled in the last ten years. We find that the amount of raw material extracted from the mines, which in 1889 was 1,458,000 tons, rose to 2,794,000 tons in 1899. Of these salts, some are employed directly by the agriculturist; others are refined, either for industrial use or for agricultural purposes, and these latter increase from year to year with a striking rapidity. Hence the erection of vast works such as these of Friedricshalle, in which the most modern processes are used for the treatment of raw minerals, while at the same time experiments are carried on with respect to improved methods in their manufacture. These details are set forth in full at the Exhibition in a striking and attractive form by a series of tables; they are also condensed in a pamphlet, prepared with great care, which the syndicate of the Stassfurt works holds at the disposal of agriculturists who visit their pavilion, or who may write for it to their Paris office (1 Rue Ambroise Thomas). This handsome exhibit carried off the first prize.

In studying the details of this pamphlet, or the tables exhibited in the German section, we find that the use of potash salts as a fertiliser is very widespread in certain countries, while in others very little is used. Germany belongs to the former, having consumed in 1899 306 kilos of potash per 100 hectares of cultivated soil, while Belgium and Holland consumed nearly 220 kilos. Among the others, we find Switzerland using in the same year and on the same extent of surface an average of 49 kilos. Great Britain and the United States both consume the same quantity—namely, 36 kilos—and, finally, France, with only 29½ kilos. We thus find that France uses the smallest quantity of this fertiliser, and this agrees with the information furnished elsewhere by the agricultural syndicates. If the consumption of potash salts has only risen from 50,000 quintaux (cwt.) in 1895 to about 88,000 in 1899, the proportion is very much less here than in the neighbouring States.

This is a fact which ought to induce fresh researches and studies. The restitution of the potash taken out of the soil should not be of less importance than is that of other elements.—G. GAUDOT, in *Journal de l'Agriculture.*

RAPE AND RYE FOR STOCK.

MR. J. R. ATKINSON, of Cullenbone, in a letter to Mr. Geo. Valder, Principal, H.A. College, Richmond, says: In May last I wrote to you about planting rape and rye, and promised to give you results of the method you suggested.

I ploughed, harrowed, and rolled land which had been sown with wheat, and, of course, had been harvested. After ploughing, harrowing, and rolling, I sowed 1 bushel of rye and 4 lb. of rape to the acre with a spring-tooth cultivator, and harrowed in with a light harrow. Finished sowing on 6th April. On 30th April put in 87 stud hogget ewes and 77 store wethers; on 8th May, 194 store sheep, 5 cows, 6 horses, 4 calves; on 16th May, 125 wethers; 17th May, 144 wethers; 30th May, 58 wethers; 5th June, 219 wethers; 14th June, 198 ewes; 16th July, 300 very old ewes to lamb, which returned 90 per cent. lambs; 2nd August, 80 stud ewes and 81 lambs; 28th September, 60 stud lambs; and I have at present—October—600 sheep in it. (I forgot to say the area was about 82 acres.) I sold all the fat sheep locally, and got prices ranging from 12s. 6d. to 15s. 6d. I gave from 7s. 1d. to 10s. 1d. for the stores. We had plenty of nice showery weather all winter. I think results very good, and will put in more next year.

NATURE-STUDY.

IN articles on agricultural education that have appeared in the *Agricultural Gazette* reference has been made to the system of Nature-study for children inaugurated by the Cornell University, U.S.A.

By the last mail the Department received a number of leaflets published in connection with the system; and there can be no question that, for the purpose of inducing children to take an interest in their surroundings and to become acquainted with natural phenomena, these little publications are truly admirable. All sorts of subjects are chosen for treatment—a ramble in the fields, the life-history of an insect, how a plant grows, the change of seasons. There need never be fear of running short of objects, and the information is given in a way attractive to the child-mind. By degrees, as the youngster's interest in his surroundings grows and his thirst for knowledge increases, his requirements are met with literature of a more advanced kind until, by the time the child is old enough to commence to think of the kind of work he is to undertake in life, he is well informed in all or, at least, a great many of the matters that constitute the basis of a sound agricultural training. The Cornell system of Nature-study does not aim at more than supplying the sound foundation. It is recognised by those responsible for the introduction of the method that little or no good could be attained by drumming into the ears of a child of tender years the fact that such-and-such a variety of wheat is better than another, or that such a time is to be recommended for cutting corn. To the adult farmer such information is, no doubt, of the greatest value; that is, it may be of guidance to him up to the point whereat he is able to discriminate and apply the information to his own peculiar conditions. But given in the shape of a cut and dried statement, it would not interest or mean anything to a child whose mind must first of all be attracted and trained, by imperceptible degrees, to grasp some of the whys and wherefores of the principles underlying natural and artificial forces.

It may be taken for granted that there is not a teacher in this Colony who does not appreciate the importance of the so-called object lesson in arousing the faculties of children, and it is also safe to assert that there is no one who has not found that the closer the method of object lessons is brought to what the Cornell authorities term Nature-study, the greater the development of the child's faculties of observation and reasoning.

In the States it is said that the problem of providing suitable literature for teachers to use in connection with Nature-study is small as compared with the difficulty of getting the teachers to take up the work. Such is certainly not the case here where the schoolteachers, in city and country alike, take every opportunity they can to encourage the pupils to interest themselves in the care of gardens, and it is this same interest in the garden-plot wherein the Cornell people locate the germ of the successful study and practice of agriculture in the future. Several publications, written with the special object of attracting the attention of children to the pleasures of home and school gardening, have been issued, and it is found in New York State, and probably everywhere else, that a neatly-kept flower-plot, which unconsciously appeals to the youngster's intellectual and sentimental side, is a most powerful factor in influencing the child, as it grows older, to love country life. The child whose eyes have been opened to the great world of interesting things all about him" is the fittest subject for broad and generous training in agriculture later on.

Since the system has been introduced and brought under prominent notice, there has been found a most gratifying desire on the part of the children for more and more information. To meet the requirements of the youngsters in a practical way, at Ithaca a Junior Field Naturalists' Club has been organised, with branches in all rural school districts. Reporting on the project, the organiser writes: "We are just beginning this work; 6,000 children in this State have been reached, and the list is growing rapidly." A periodical called the *Junior Naturalist Monthly* is issued by the College of Agriculture and Experiment Station. It is a splendidly got-up little publication of four pages. Most of the articles are from the pen of Miss Alice McCloskey, and are written and illustrated in a way that must prove most fascinating, and at the same time instructive, to youngsters. Indeed, it is more than probable that the parents of a good many youthful recipients and correspondents of the journal find the articles of absorbing interest.

Regulations concerning the Importation of Plants into Natal.

The Natal Government, with the object of preventing the introduction of pests and diseases, have issued a proclamation to the effect that all plants and cuttings, of whatsoever description, shipped to Durban—the sole port of entry—must be accompanied by a certificate from the Department of Agriculture at the port of shipment certifying to the freedom of the plants from any disease or pest.

Barley for Malting Purposes.—What the Rothamsted Experiments have shown.

If the malting quality of the grain is to be taken into account in the introduction of new selected or crossed varieties of barley, due regard should be given to the following considerations:—The heavier the straw, the coarser and, therefore, the lower in value will be the grain generally. A low ratio of grain to straw usually goes along with grain with high content of nitrogenous matters and defective maturation. A large, coarse grain of high weight per bushel is not as good malting material as a smaller grain well matured—in fact (given vitality) maturation is the most important quality of barley from a malting point of view, and generally, with the varieties at present cultivated, the smaller grain is the better matured. If by means of selection or cross-fertilisation varieties of larger body, but maturing equally well, can be secured, a great step in advance will be made.

Maturation is physiologically a post-ripening process, the character of which depends largely on the pre-ripening, and this, in turn, on the soil conditions. Too early ripening on thin soils due to drought, and too late ripening on strong soils, both give a highly nitrogenous grain, which will not mature well even under favourable natural conditions, and is always more or less steely and unworkable. Even with well-ripened grain maturation depends on sufficient time being allowed before and after cutting, but, above all, on weather conditions.

The Rothamsted results with barley grown in the Norfolk rotation, extending over more than fifty years and with twelve different cultural conditions, lead to the following conclusions :—

The good effect of soluble phosphates on quality of grain is (as was also shown with continuously grown barley) most marked. The plots manured with minerals only have given the best yield of grain in proportion to straw, showing the unmistakable effect of phosphates in assisting grain formation. The series of plots also shows a lower percentage in the grain of nitrogenous matters than either of the other series. The barley, though often comparatively small, is well matured—better in this all-important respect than where no phosphates are applied, and also better than where, with heavy nitrogenous dressings in addition to minerals for the preceding roots, the land is in better condition and gives much higher yields.

As between roots carted and roots fed as preparation for barley, the effect of the higher manuring on the quality of the succeeding barley is not at Rothamsted, taking the average of the years, very great either way, although, of course, there is much heavier yield than where the roots have been carted. The maturation of the grain is frequently, though by no means always, better after carted roots ; but the difference in this respect is counterbalanced by an almost uniformly larger grain on the "fed" plots—counterbalanced, that is, as far as what, to the best of our judgment, would be the relative market value of the grain ; but we think, in view of our determinations of degree of maturation and content of nitrogenous matters, that the "after roots carted" barleys are better than they look in relation to those after roots fed (or cut up and spread). In any case it has to be remembered that no added food of any sort has ever been fed on the plots, and that, therefore, the generally accepted opinion that roots fed, with oil-cake added, is too good a preparation for barley, as far as quality is concerned, is not controverted by these results.

The general effect of high "condition" of soil on the quality of barley is shown at Rothamsted in the comparison afforded between clover as against a year's fallow in the rotation. The average results under every condition of preparation for the root-crop show that this leguminous crop leaves a residue which increases the yield, but gives less well-matured grain. Apart, however, from the value of the included clover crop, the increased yield of grain more than compensates for the somewhat lower maturation. It is a remarkable fact that the effect of this crop is, in recent years, more apparent upon the barley three years after than it is upon either the wheat or roots which intervene. It points to the fact that barley is, of all the farm crops, the one which is most affected by "condition" of soil, and this is true, not only of the total amount of produce, but also of the character of the grain.

It is an unfortunate deduction from all the research which has been given to this matter by others, as well as ourselves, that the soil conditions which increase yield are frequently not those which improve quality. It is even more clear that all the various conditions combined have far less influence on quantity and quality of produce than the season has. Weather conditions are, fortunately, unlike soil conditions in this respect: that those which favour grain formation and good yield are also favourable to good quality.

The fact that barley does not want, for quality, too high condition of soil, points to "after wheat" as the best preparation for the crop. This plan is not, of course, adopted solely, or even mainly, in view of better probable quality of barley. It suits the arrangements of the farm in many other respects in some districts. As regards the barley, what is lost from lower "condition" of soil as against "after roots fed" is frequently made up for, in respect of yield, by the better tillage possible, and in quality by the better maturation which is due to earlier seeding and ripening. Early seeding is not always possible after roots, and the more "kindly," if smaller, grain, which is generally produced in districts where the "after wheat" practice is the custom is, we think, the combined result of generally more favourable conditions for the ultimate maturation of the grain.—*The Cable and Agricultural World.*

SOFT CHEESE FOR PROFIT.

ROUGHLY speaking, the utensils, &c., wanted are the same for all soft cheeses—a thermometer, wooden tubs or earthenware bowls for setting the milk, a ladle for removing the curd, moulds, with mats and boards, rennet, and a pipette; also, for some varieties, coarse linen cloths. The pipette is a little glass tube, specially made for measuring small quantities, and marked so exactly that, with a little practice, anyone can measure to a drop the amount required; and as, in soft cheese-making, very little rennet is desirable, it is better to add the right quantity and no more. The moulds vary according to the cheese, each kind having its distinctive size and shape. Besides, the method of manufacture differs a little in every case, and the mould suitable for one kind might not answer for another.

The following rules apply equally to every kind of soft cheese:—The milk must be pure and sweet, carefully strained, and, if possible, set warm from the cow. The setting temperature must be correct, a degree or two will make a difference, and care must be taken that the temperature does not fall during coagulation. For this reason wooden tubs are preferable to other vessels for setting the milk, as they retain the heat best. The rennet must be accurately measured (using only the required quantity), added in a little water, and thoroughly mixed with the milk by stirring for from three to five minutes. The cheese-making room must be moderately warm, and the temperature kept as even as possible. Last, but far from least, everything connected with the work must be kept scrupulously clean. The varieties to which I am about to refer are already very popular in some places, and with little practice can be made without fear of failure, but where at all convenient I would advise beginners to take a few lessons at such a place as the British Dairy Institute, Reading, as there are many little details one wants to see done, and many valuable "tips" can be picked up by a little observation.

Cambridge is a little cheese easily made, and very much liked by some people. A little less than 10 gallons of milk will make a dozen cheeses. The milk (carefully strained) is set at 95° F., and enough rennet is added to enable the curd to be ladled into the moulds in about an hour. Different makes of rennet vary so much in strength that the cheese-maker must be guided by experience as to the exact quantity, but 1½ cubic centimetre of Hansen's extract will be found sufficient for 16 lb. of milk. After adding the rennet the milk is stirred for about three minutes with a Scotch hand or wooden instrument, then the tub or bowl is covered to keep in the heat, and it is left to coagulate. When the curd will break clean, and show a little green whey in the split, it is ready to ladle into the moulds, which have previously been well scalded and cooled. The Cambridge moulds are wooden, oblong in shape, and rather deep (about 8 inches), with holes in the sides to allow drainage. They stand on a wooden frame, and into each little frame a straw mat is fitted. Before ladling, rather thin slices of curd are removed with a skimmer and reserved, one for each cheese. The curd is now ladled gently and equally into the moulds, a thin unbroken slice is placed on the top, and over it a small piece of wet muslin or parchment paper, to keep the curd moist and free from dust. The curd is then allowed to drain, and, except to see that it is sinking evenly (no corners sticking to the sides of the mould), it requires no further attention, provided the room is kept at a suitable temperature. It is not turned or salted. In forty-eight hours the mould can be taken off, and the cheese is fit for use. The straws will be found to be slightly embedded, and are not removed. Cambridge cheese should only be about 2 inches thick, and the top should look as if the edges had been folded over; when fresh they are quite white, soft, and tempting in appearance. They are generally sold at 1s. 4d. each, retail.

Coulommier is delicious, and is almost as simple to make. Six gallons of milk will be found sufficient for twelve cheeses. The milk is set at a much lower temperature than for Cambridge, and less rennet is added (1½ cubic centimetre to 30 lb. of milk). The curd requires a a long time to coagulate. In fact, it ought not to be ready to ladle for from five to six hours after renneting. The mounds for these cheeses are of tin, of round shape, and in two pieces, one part fitting on the other. The moulds are placed on straw mats and boards, and the curd is ladled in gradually. When the moulds are full they must be left undisturbed until the curd has sunk low enough to allow the upper part to be removed. The cheese must then be turned on to fresh mats and boards. To do this, the fresh mat and board are placed resting on the mound, the used one being still underneath; both boards are then held tightly, and at the same time reversed. The fresh one is now underneath, and the other can be removed. Although this is quite easy, the action is not easily described. When the cheeses are fairly firm, they are salted slightly. They are ready for sale in two days, and fetch about 6d. each.

Gervais is another favourite soft cheese. It is made rather differently. One part of fresh sweet cream is added to two parts of new milk, and both are thoroughly mixed. Rennet (about two drops to each quart) is then added at a temperature of 65° F. Next morning the curd is ladled into a cloth, and hung up to drain, the sides of the cloth being scraped down occasionally. When the curd is firm a very little salt is added, and the moulds are then filled. The proper Gervais moulds are very small, and are sold in sets of six or twelve together. Previously to filling in, each should be lined with paper.

Double Creams are so generally known that is is only necessary to say that they are made very similar to Gervais, but as the name denotes, they are cream cheese, no milk being added. The cream must be perfectly fresh, and when obtained from a separator must be cooled to a low temperature in the first instance. They can be made with or without adding rennet.

These varieties of soft cheese might be successfully made in any farmhouse by anyone with an average amount of intelligence; cleanliness, carefulness, and nicety in preparing for market being all that is required, and where there is a sale for them they will return from 9d. to 1s. per gallon for the milk, which butter at summer prices will never do. At the same time is must be remembered that soft cheeses will not keep long; therefore the supply must not exceed the demand, as any remaining on hand will be a loss. Anyone trying them as a new speculation should begin gradually, making too few rather than too many at first, increasing the manufacture as the customers increase, but with a little perseverance it ought not to be difficult in any well-populated district, especially near a town or at the sea-side, to work up a good market.—By Miss E. A. Humphreys, in *The Cable*.

Harvesting and Storing Sweet Potatoes.

A good many people find it a great deal easier to raise a big crop of sweet potatoes than to devise means of storing the tubers they wish to keep for use or sale when stocks are depleted. By degrees sweet potatoes are coming into favour, and every year increased quantities are to be seen for sale in the greengrocers' shops and carts. During the earlier part of the season the tubers are in excellent condition as a rule, but later on they cook all colours and present anything but an appetising appearance. Mr. D. W. May, an American authority on the subject, has been looking into the question of the best method of storing them. Numerous experiments have been tried at various agricultural experiment stations. The Texas Station points out that it is very important to determine whether the crop is ripe before digging the tubers. If, when a sweet potato is cut, the sliced surface partially heals and becomes dry, the crop is ready to be harvested; but if the cut place turns greenish-black, the tuber is not mature. It is useless attempting to keep bruised tubers; they should be used at once, as soft-rot is very liable to set in.

In Georgia some sweet potatoes were stored in a pit in the ordinary way, on 23rd November, and all but 7 per cent. were sound on 1st April. The sound roots were in excellent condition, not sprouted, and when sampled on the table of first-rate quality. At the New York Experiment Station tubers packed in dry road dust and kept at a temperature of 60 degrees continued fit for the table for several months. At South Carolina Station experiments were tried by packing the potatoes with various materials in barrels. The materials used were sand, damaged lint cotton, wheat, bran, hay, newspaper, and cotton hulls. Dry sand and cotton hulls gave the best results. Wrapping each potato in paper induced rapid decay, but a double lining of paper next the barrel was fairly effective in keeping out cold and preventing rot. The keeping qualities of large and small tubers appeared to be about equal.

At the Texas Station it was found that good results followed the practice of allowing the tubers to remain in the ground till wanted for use.

Tubers that are to be stored should not be dug until perfectly mature, and should be allowed to dry in a shaded place for about two weeks, and then carefully sorted, any with soft tendencies being rejected. They should then be packed with dry road-sand in a well-ventilated building. The packing sand should be changed each year, as it may become infected with black rot. The sand proves a sufficient protection against mice.

Where the vines are to be stored for stock feed the Arkansas Station recommends that they be put into a silo, as they do not readily cure into hay.

SPRING WHEAT EXPERIMENTS.

"HOPEFUL" writes to the *Australasian:* As far as I have been able to ascertain, there have been few experiments with spring-sown wheat in Victoria. One that Mr. Pearson told me of as having been sown on 1st September gave but a very poor return, the weeds having preponderated. It seems probable that were the sowing done later still, the early spring weeds having been ploughed in, a better result might be attained. The following is the result of four experimental plots of 3 square yards each at Ascotvale, four seeds being sown in each square square foot:—

Date.		Return.	
Sown.	Harvested.	Bushels per acre.	Fold.
21 Sept., 1898	29 Feb., 1899...	18	62·5
23 Sept., 1899	6 Feb., 1900...	10·92	55
23 Sept., 1899	6 Feb., 1900...	13·44	50
6 Oct., 1899	6 Feb., 1900...	15	61·8
Average...		14·34	57·3

They were not all the same class of seed, the one which returned fifty-five fold, and at the rate of 10·92 bushels per acre, being a very much smaller grain than any of the others. These four experiments seem to give hope that a satisfactory spring-sown crop might be obtained. Of course, such could not be expected except under favourable conditions. The question arises, Has the money which has been spent on irrigation works created these favourable conditions? If so, it seems feasible that a spring-sown crop might be the means of recouping the country interest at least for the capital now dormant in the works, from which so much was hoped. If some more extended experiments than I have the opportunity of conducting were made, I believe the results would be encouraging.

CANNING TOMATOES.

WHEN tomatoes can be grown so as to be ready for market very early or very late in the season, the most profitable way to dispose of them is in a fresh condition. But during mid-season, when huge quantities all ripen at once, prices for fresh tomatoes are apt to fall below a remunerative rate, and it will probably be found more profitable to convert them into sauce or preserves.

In some of the tomato-growing districts of the United States the tomato crops are so large as to warrant the establishment of canning factories, to which the farmers for miles around send their surplus, and very often their whole, crop. It may be some time before we are in a position in this Colony to go in for the work on a scale so extensive as that described hereunder by Mr. L. D. F. Cone in the *American Agriculturist*, but there is no reason why a start should not be made, even in a very small way. The methods described are those practised at most of the factories in Delaware, Maine, New York, Indiana, Illinois, and Iowa:—

"A bushel of first-class tomatoes will fill about twenty-five 2-lb. cans. The first process is washing, to remove all dust and dirt. This is done by turning a few bushels into a deep vat filled with cold water, where they are slightly agitated a few minutes, and then transferred, by means of an iron basket closely fitting the vat, and operated by a windlass, to a second vat filled with hot water, where they remain but a moment. They are then turned into a trough, from which they are carried in pails to a small army of girls, who remove the skins, already loosened by scalding, cut out imperfections, &c.

"The tomatoes, now cleaned, are turned into the hopper of the filling machine—an ingenious device which automatically fills about 2,400 cans per hour when running at full speed. In its operation the assistance of three people are required—a woman who gives a final inspection, removing any imperfections previously overlooked, and adding occasionally a sprinkle of salt; a boy, who fills the shute with empty cans to supply the machine; and a man to remove the cans, now filled, as they roll from it. They are placed on iron trays, each tray holding fourteen cans. About twenty trays are laid on a truck and rolled into a 'hot box,' where steam is allowed to enter and warm them slightly, to prevent chilling the solder, during the sealing process. After two or three minutes they are withdrawn, the tops of each can carefully cleaned, the caps put in place, and then they are sent to the capping machine, as it is called—another labour-saving device, which automatically seals six cans at a single stroke. The solder is wound on rolls suspended from above. A 'feed' furnishes the required amount for each can. The solder is instantly melted by gas jets, with which it is brought into contact. The capacity of this machine is 2,400 cans per hour. The caps each have a small hole in the centre to allow any steam to escape, and ensure perfect soldering.

"After leaving the capping machine these holes are quickly closed by skilled hands, and the cans otherwise inspected, after which they are ready for the cooking; 440 of the 2-lb. cans are now placed in an iron basket, a derrick conveying them to a vat, into which they are lowered and boiled for forty minutes. The 3-lb. cans require forty-five minutes, after which they are taken to a remote part of the building set apart for the purpose, and turned out on the floor to cool. The final act is sticking on the labels and packing in cases ready for delivery. As in nearly all industries the percentage of waste is considerable; every stage and process is carefully watched, and where defective cans are detected they are thrown out, the greatest loss probably being in swelled heads during the cooking, and caused by imperfect soldering. Cans remaining perfect in shape must necessarily be perfect. The 2-lb. can is in greatest demand, about two-thirds of the output being of that weight. The balance are 3 lb., there being found little or no demand for smaller tins."

A THRIVING WATTLE PLANTATION.

On the mountains, not far from Maritzburg, in Natal, the Town Hill Wattle Company eight years ago acquired a tract of 3,000 acres, and commenced to plant wattle trees for bark. At the present time 2,400 acres are planted, the trees standing 6 feet apart in rows 12 feet wide. The soil is poor in quality, of a red colour, and light and porous. A correspondent of the Natal *Agricultural Journal* recently interviewed the manager of the plantation, Mr. J. A. P. Ellis, and it is thought the following particulars from his report may be of considerable value to people in New South Wales interested in the production of wattle bark, for which there is so great a demand and so little provision. The land is broken up about Christmas-time, and well harrowed. In February the planting is done, and the ground receives no further attention until the autumn of the following year, when the space between the young trees is ploughed to aerate the soil, and, at the same time, protect the trees from the ravages of fires. Trees in Natal do not reach their prime, either as regards bark or timber (the company have a market for all their wattle timber for mining purposes and firewood) till about the tenth year. Insect pests, in the shape of locusts and bag-worms, do considerable damage to the trees, and grass fires are a great source of anxiety. "In August and September no plantation in Natal is absolutely safe in the event of fire starting with a high wind, for the undergrowth in most cases is sufficient to feed a fire in a hot wind." To protect their plantation, the company have nearly 50 miles of fire-breaks, boundary and dividing. It is costly work, but is regarded as a sort of insurance premium. The stripped bark is brought in by means of a tramway, which also connects with the nearest railway station.

The shed for drying the bark is 250 feet in length, with its back to the weather quarter. From the back, along the whole front of the building, a series of very broad-guage tram-lines, 6 feet 6 inches from the ground, on wattle posts, like an overhead railway, run out a distance of 126 feet. On what may be called these tram-lines there rests a flexible ladder of thin poles overlapping the rails on either side by a foot. The sides of the ladder are light chains, a dog-spike at the extremities of the rungs entering the chains at 15 inches apart. The last rung is a stout pole for the hauling wire, which wire runs over a pully at the extremity of the tram-line. As the bark arrives for drying it is thrown over the rungs of the extended ladder. When rain or mist threaten, a wire from the back of the shed is drawn by a couple of oxen, and the flexible ladder with its load comes under the shed, the load of bark hanging from each rung being closed up compactly like the bellows of a concertina or the laths of a venetian blind, if they were run in horizontally from a couple of guides. On the return of fine weather, the ladders are again drawn out. The capacity of the shed is 120 tons. At one time there was apprehension that it might become necessary to send the wet bark down the hill below the mist line for drying—for much depends on the proper drying of bark—but this system of shed drying has disposed of the necessity for such costly procedure.

Close by is the shed for chopping the bark, sawing the poles, &c., the motive power being a 12 h.p. engine. All the machinery is well set on exceptionally solid foundations, and the shed seemed advantageously planned for avoiding unnecessary handling, both as regards the placing of the machinery and the run of the tram sidings. In reply to a question, Mr. Ellis said he had not been able to do anything profitably with tannage or cutch. The former, as many know, is an infusion of tannic matter derived generally from the waste small branches of the tan trees, and the latter (cutch) is the same inspissated—evaporated to a solid consistency. For making cutch, he said that a plant of vacuum pans, &c., costing £8,000, would be required.

From a commercial point of view the company's operations have been attended with great success.

THE MANUFACTURE AND CONSUMPTION OF JAM IN ENGLAND AND GERMANY.

In reproducing the results of an inquiry conducted with the object of learning some of the reasons why English people eat so much more preserved and jammed fruit than Germans, the *Pacific Rural Press* says that as California is now participating to some extent in the supply of fruit to England, it is well for growers there to see what the requirements of the two nations are. Hitherto it appears that the bulk of California fruit, beyond that exported fresh, has been utilised for the production of high-class canned stuff, and the manufacture of jam has not been troubled about at all. Concerning the possibilities of the English and the German jam traffic, the inquiry shows that while in Germany the potato is largely the principal food, the Englishman eats green salads, vegetables, and fruit. The importance of these foods lies in the value of the use of sugar and fruit, and England has recognised this. While, on the average, each person in England uses annually 88 lbs. of sugar, the average in Germany is less than 22 lbs. The difference in the use of fruit is about the same. Wherever it is possible to use sugar and fruit in the food, this is done in England. There, jam and marmalade, unmixed or in the form of pies, tarts, &c., are eaten after all meals, and especially at breakfast. A workman regards a fruit pie as a sufficient dinner. Sweet biscuits and cakes are manufactured in immense quantities. Temperance eating houses offer tea and chocolate with fruit and pies, instead of beer and alcoholic drinks. In German eating houses and hotels drinking is almost compulsory.

One biscuit factory employs 6,000 workmen, and ships daily forty to fifty double waggon loads, each of over 13,000 lbs. Supposing only 25 per cent. of this to be sugar, the amount of sugar used in a year must be at least over 20,000 tons.

According to the statement of Mr. Matthieson, director of the jam factory of Clarke, Nickolls, & Coombs, 400,000 tons of jam, containing 225,000 tons of sugar are produced annually in England, while the entire industry uses altogether over 300,000 tons. In jam and marmalade alone, each person in England uses daily 17 grams of sugar. If Germany can, through the increased use of domestic fruit products, raise its average to 10 grams, this will cover 10 per cent. of the entire German sugar production.

The Manufacture of Jam and Marmalade in England.—The fruits are first stemmed in machines provided especially for the purpose; then they are cooked soft in a copper pan in order to free them from seeds and skins by passing them through other machines. This cleaned fruit is thickened by further cooking, and set aside in stoneware vessels until needed. An advantage of this storing of partially prepared jam is that the factories can work uninterruptedly through the fruit season, and lay aside other work for a less busy time. This is rendered possible by the sterlizing of the fruit by cooking. If time permits, the cooked fruit is sweetened by clarified sugar, fifty-six parts of sugar being used for sixty parts of fruit. This ratio varies, however, as allowances must be made for acidity, sweetness, flavour, &c. In order that the jam may remain soft enough, which would be hindered by a crystallising of the sugar, after it is finished 10 per cent. of capillary syrup is added. In addition to this warm process for the manufacture of jam, there is also a cold one. The warm process renders possible the utilisation of unripe fruit without causing danger to the health of the consumer. The cold process is used with ripe fruit. This method preserves the flavour, which is lost under high temperature and high pressure. The use of the word marmalade in England is confined to jams made of oranges and lemons which are cooked with their thin skins, whose pectin changes the jam into a mass resembling jelly.

German Jam and Marmalade.—Germany already manufactures so-called apple butter and plum and pear marmalade, especially in Strassburg, Coblenz and Metz. Most of this does not, however, deserve the name of fruit marmalade, as it is made from fragments left over from manufacture of dried fruit and fruit wine. A comparison of English and German wares will reveal the difference. The English marmalade is good fruit mush and sugar; the German consists of unappetising fragments without any sugar. In England, 10 per cent. of starch syrup is added; in Germany, 60 per cent. to 70 per cent., with its ingredients of sulphuric acid, dextrine and gallisine. The Englishman will not even use 10 per cent. of German watery potato syrup, as this injures the quality of his jam. He gets fine glucose from America, because it is there made from maize, instead of potatoes, and because the American capillary syrup does not, like the German, contain sulphuric acid. German marmalades are accordingly unlikely to win a place in the world's markets.

CARBON BISULPHIDE FOR WOOLLY APHIS.

WHEN woolly aphis attack the roots of an apple-tree, the wisest course seems to be to dig the tree out, burn it, and plant some other class of tree not liable to be affected by the insects that may still lurk in the ground. There are very often special reasons why an otherwise flourishing tree should be retained; and although it is beyond expectation that a tree or a stock affected by woolly aphis will not always need vigilant care, the pest can be kept in subjection most effectually by the use of carbon bisulphide. The method of application usually recommended is to inject, by means of a special pump, two doses of about 1 oz. each into the ground 2 feet from the tree, and after an interval of five days another 2 oz. carbon bisulphide in ten yards square around the tree in doses of 5 grams per square yard (see Insect and Fungus Diseases, p. 6). Mr. W. Irvine, a Californian grower, who has about 6,000 apple trees, writing to the *Pacific Rural Press,* says that after trying all sorts of treatments for the pest, which attacked about 150 of his trees, he tried the application of carbon bisulphide on a plan of his own. He found it easy to locate the affected trees by their excessive bloom and numerous sprouts emerging just about the base of the trunk. With an ordinary gardener's trowel he dug small holes a foot from the tree on each side 6 inches deep, and poured from a half-pound bottle half a teaspoonful (by guess) in each hole and covered it up quickly. One pound of carbon bisulphide, which cost him 5d. wholesale, sufficed for 125 trees. Of the 150 trees treated he lost fifteen, and they were so badly affected that they would have died in any case before the close of summer. Of the remaining 135 all but one seemed entirely free from the aphis, and at the time of writing had made good growth. Carbon bisulphide is extremely volatile, and will permeate the ground about the affected roots, destroying the insects. Great care must be taken not to use larger quantities than those recommended or the tree will be killed outright as well. There are a good many things less offensive to the smell, but there are few chemicals that will explode with more violence; so in using carbon bisulphide particular care should be taken not to let the fumes come in contact with a light.

GRASSHOPPERS AT CONDOBOLIN.

LAST month the Entomologist visited Condobolin district with the object of affording agriculturists suffering from visitations of plague-grasshoppers information as to the most effective means of coping with the pest. Numerous experiments were carried out at different centres; and spraying the herbage and grass around a crop and garden with a mixture of arsenic, soda, and sugar, would seem to be one of the cheapest and most effective means of destroying the insects, which readily eat the sweetened, poisoned grass. Dipping freshly-cut green-stuff into a similar mixture had not the same effect, as the sticky mixture was not spread so evenly over the poisoned food. Pollard or bran with sugar, or Paris green mixed into a paste and strewn among the garden plants, also attracted and killed a great number.

The inoculation with South African fungus disease was not very successful, as the weather was hot and dry, though great numbers of locusts were captured and dipped in a preparation of the fungus and then liberated, so that they might spread the disease among the remainder. Mr. Froggatt accordingly distributed a number of tubes of the fungus-culture among local residents who are interested in the work and know how to make use of the fungus. On the first damp day these gentlemen will commence operations, and have been good enough to promise to report the results for information of all interested in locust destruction.

The Entomologist points out that if everyone whose property were likely to be invaded by locusts were to keep watch each year for the first appearance of young swarms, and burn the grass around the small areas then infested, the inroads of the pest would be greatly checked. This season Mr. Froggatt saw several places where the tiny young hoppers were so thick that the ground looked like an immense ant-bed, and they could have been burnt in millions with very little trouble.

APHIS ON WHEAT-STALKS.

ON 30th September, Mr. Lamb, of Carrego, Carrathool, submitted to the Department some stalks of wheat injured by insects.

The crop from which the specimens were taken was, at the time of writing, looking very healthy, 5 feet to 5 feet 6 inches high, and just flowering, but in every stool one, two, or more stalks had been attacked and had broken off. On the 27th September, Mr. Lamb reports, there was a pretty sharp frost, but beyond the breakage of the injured stalks, it did not appear to affect the crop. On close examination of the broken stems, a small grub was found, but only in few cases.

On investigation, Mr. Musson, of the Hawkesbury Agricultural College, found a chrysalis that resembled that of the Hessian fly, and in view of the gravity of such a discovery, arrangements were immediately made for the Entomologist to inspect the crop and report as to whether the trouble was due to the dreaded Hessian fly. Upon arrival at Carrathool, Mr. Froggatt found that the insects responsible for the damage were plant-lice (*Aphidæ*), and he could find no sign of Hessian fly. The aphis appears to have attacked the wheat-stalks when about 6 inches in height, and sheltered by the enveloping flag, the pest sucked up the sap on one side, which caused the young wheat stalk to bend over, and in some cases almost twist into a knot before shooting upward again. Then a parasitic fly appeared on the scene, devoured the aphides (plant-lice), and pupating fell to the ground. The parasitic flies had been so numerous that their hard pupa-cases, mingled with the remains of the aphides they had destroyed, covered the ground beneath the wheat.

The wheat (now fully 4 ft. 6 in. in height and bearing splendid heads) then shot up, but as the heads began to fill, the weight caused thousands of the stalks that had been attacked by the aphides to break off where the stem was twisted, and in some of the richest patches as many as 10 per cent. of the heads had fallen within a few weeks. Though aphides have been known to come on to growing wheat, this is the first record of their damaging it in the remarkable manner described.

Late in October, Mr. J. V. Ingram, of Norwood, Deniliquin, forwarded some stalks that were affected very much in the same way as that at Carathool. Mr. Ingram said he had never seen wheat damaged in that way before. He had patches of acres extent in which 20 to 30 per cent. of the stalks were broken off. The crop generally appears to be healthy; in no instance was a whole plant affected, the breakage being confined to one or more stalks.

Mr. Froggatt is of opinion that the trouble in Mr. Ingram's case is identical with that at Carrathool. So far as is known, there is no practicable method of destroying the aphis beyond eating off the infected crop with sheep.

THE BERRY STUD FARM.

ARRANGEMENTS have now been completed for the admission of students to the Berry Stud Farm—the prospectus of which appeared in the October issue of the *Gazette*. Students have the privilege of obtaining a practical knowledge of butter-making at the Berry Central Factory, one of the largest and best-equipped factories in Australia. The course of training extends over twelve months, for which a fee of only £2 2s. is charged. There is no accommodation at the farm for students, but board and lodgings can be obtained at a low rate in the neighbourhood.

Replies to Correspondents.

Troubles with Bee Swarms.

Mr. R. Howard, of Buxton, writes:

"1. I have many times hived colonies of bees in framed hives with strips of comb foundation, and cannot get them to stay. Can you give me any likely reason, or reasons, for this?

"2. Will you also kindly inform me whether, having been hived with the queen, they ever go back, even temporarily, to the old home. I have watched swarms, after having settled, gradually return to the old hive, but (3) some of the swarms I have boxed have disappeared, and in every instance, save one, without my knowledge, though I knew the queen to be hived with them. My latest experience was on 23rd October, when a swarm hived three days previously disappeared without my knowledge, although watched."

In reply, Mr. Albert Gale says it is not easy to give any reason for the bees leaving a hive in the manner stated (1) unless there was something about the hive that was distasteful to them. It may have been due to the absence of the queen, which may not have accompanied the swarm from the parent colony. If her wings were clipped she would, of course, be unable to follow the swarm, and without her presence the swarm would not be inclined to settle in their new home. A sure remedy for this is to take a frame of brood-comb, containing eggs and very young bee-grubs, and put it in with the swarm when you hive them. (2) Bees will sometimes return to the parent hive. (3) Cast swarms, to which reference has been made in current articles on bee-keeping, often leave their hive and disappear altogether, but it seldom occurs with the first swarms of the season.

Water-glass Solution for Preserving Eggs.

Favourable reports as to the use of water-glass solution for preserving eggs continue to come to hand. Occasionally, however, the treatment is found unsatisfactory. This is, in some cases, due to low-grade water-glass, and it would be well for anyone who has reason to feel suspicious about the quality of the water-glass to submit a sample to the Department for examination.

In storing eggs in this, or, for the matter of that, in any other way, the utmost care should be taken to ascertain whether they are quite fresh. Even in the best-regulated poultry-yards an odd egg or two, laid in some obscure corner by an eccentric hen, may be overlooked, and the discovery of those defective eggs may lead to wrong conclusions as to efficiency of the solution. A sound egg will sink in the solution prepared in the ordinary way. If there is no doubt as to the freshness of an egg, and it floats, the solution is too strong, and it is necessary to add more water until the egg sinks.

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